

Ex-Ante Evaluation (for Japanese ODA Loan)

1. Name of the Project

Country: The People's Republic of Bangladesh

Project: Bheramara Combined Cycle Power Plant Development Project

Loan Agreement: February 20, 2013

Loan Amount: 41,480 million Yen

Borrower: The Government of the People's Republic of Bangladesh

2. Background and Necessity of the Project

(1) Current State and Issues of the Electricity Sector in Bangladesh

The annual power consumption per capita in Bangladesh is at world's lowest level, 170kWh (FY2009/10), and the electrification rate is also low at 47%. The electricity supply cannot meet the increased demand: in FY2009/10, the peak demand reached 6,454MW but the installed capacity of electricity supply was 5,271MW only and the maximum power-generating capacity was a mere 70% or so of the demand. Thus, the country was obliged to perform planned outage chiefly at peak times. Due to an improvement in the electrification rate and industrialization thanks to the recent high economic growth, electricity demand is expected to increase by around 10% per year for the time being. The supply-demand gap is likely to remain due to delay in construction of new power generating plants because of fund shortages and other reasons. Accordingly, Bangladesh is faced with an urgent issue of establishing a stable electricity supply system through development of new power sources (particularly highly efficient power plants), diversification of energy sources including coal-fired thermal power, and rectification of system losses in the electric power transmission and distribution.

(2) Development Policies for the Electricity Sector in Bangladesh and the Priority of the Project

The Government of Bangladesh cites three long-term visions for the electricity sector in the "Policy Statement on Power Sector Reforms (2000)", which are (a) securing of the supply capacity so that all citizens can use electricity by 2020; (b) reliable electricity supply; and (c) electricity supply at appropriate prices. The Sixth Five Year Plan (FY2011-FY2015), the latest national plan, refers to the necessity of reform on the electricity sector, viewing it as important infrastructure for economic growth leading to poverty reduction, and set out goals to increase the power-generating capacity to 15,457MW by 2014/15 and to 20,000MW by 2020/21, and the electrification rate to 68%. This project will, in line with these national policies, construct a highly efficient new-type power plant and support building of the operational structure of power generating companies that were spun off in accordance with the sector reform. Meanwhile, "The Bangladesh Climate Change Strategy and

Action Plan (2008)” stipulates action policies that infrastructure for higher efficiency in power generation, transmission and distribution in the electricity sector will be established to realize a low carbon society.

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

The Country Assistance Policy for Bangladesh formulated by the Ministry of Foreign Affairs of Japan in June 2012 views “acceleration of economic growth from which all the citizens can benefit to become middle income earners” as one of the priority areas, and shows the intention to assist development of power generating plants and transmission and distribution networks to overcome the shortage of electricity. Based on the policy, JICA designed the Country Analytical Work (February 2012), which regarded the electricity sector as a priority area and showed the intention to assist infrastructure development, and formulation and implementation of plans for comprehensive sector reform in collaboration with other donors. Thus, this project is consistent with the policies of the Japanese government and JICA itself. To date, Japan has given positive assistance to the electricity sector in Bangladesh, including the Program for Improvement of Solid Waste Management in Dhaka City toward the Low Carbon Society (2009. Grant Aid for Environmental Program). Major assistance programs conducted for the electricity sector in Bangladesh are as listed below:

- Loan assistance: National Power Transmission Network Development Project; Central Zone Power Distribution Project; New Haripur Power Plant Development Project; and Rural Electrification Upgradation Project
- Technical Cooperation: dispatches of advisors on electricity policies; training on Total Quality Management (TQM); and study for master plan on coal power development

(4) Other Donors' Activity

As major donors, ADB and WB have been supporting the electricity sector reform in Bangladesh, including spinning-off and improving business efficiency of electricity companies; development of new power sources; development of transmission and distribution networks; and energy efficiency.

(5) Necessity of the Project

This project deals with tight electricity demand in Bangladesh by constructing a highly efficient new power plant and promotes the sector reform in collaboration with other donors by assisting development of the organizational structure of North West Power Generation Co., Ltd. (NWPGCL). It also contributes to alleviation of climate change by constructing a highly efficient new power plant. An ODA loan for the engineering services (E/S) for designing, bidding assistance, construction supervision and enhancement of the organizational capacity for this project was already made in FY2009. As stated above, the project conforms to the policy of the Bangladeshi government, and the assistance policy of the Japanese government and JICA. Thus,

the project is highly necessary and relevant.

3. Project Descriptions

(1) Project Objective(s)

The objective of this project is to stably supply electricity and deal with increased electricity demand by establishing a highly efficient combined cycle power plant in the western zone of Bangladesh where the electricity demand is tight, thereby contributing to the improvement of industrial competitiveness and living standards of the targeted region as well as the enhancement of mitigation measures against global warming.

(2) Project Site/Target Area: Bheramara Upazila, Kushtia District, Bangladesh

(3) Project Components (Including the Procurement Method)

- 1) Construction of a combined cycle power plant (360MW class) and associated facilities (international competitive bidding)
- 2) Development of the SCADA system for gas transportation network (international competitive bidding)
- 3) Consulting services (detailed design review for the above-mentioned SCADA system, bidding assistance, construction supervision, strengthening of the operation and maintenance capacity, etc.) (short-list method) (An ODA loan for E/S (designing of the power plant, bidding assistance, construction supervision, strengthening of the operation and maintenance capacity, etc.) was already given in FY2009.)

(4) Estimated Project Cost (Loan Amount)

Total Project Cost: 58,995 million Yen, including ODA Loan Amount: 41,480 million Yen

(5) Schedule

From February 2013 to June 2019 (77 months). The project will be completed when all the facilities start operation (June 2016).

(6) Project Implementation Structure

- 1) Borrower: the Government of the People's Republic of Bangladesh
 - 2) Executing Agency: North West Power Generation Co., Ltd. (NWPGCL). However, Gas Transmission Co., Ltd. will be in charge of development of the SCADA system under the supervision of NWPGCL.
 - 3) Operation and Maintenance System: the same as the executing agency above.
- #### (7) Environmental and Social Consideration/Poverty Reduction/Social Development

1) Environmental and Social Consideration

① Category: A

Reason for Categorization: this project falls under the thermal power generation sector under the "JBIC Guidelines for Confirmation of Environmental and Social Consideration" (established April 2002).

- ② Environmental Permit: the detailed Environmental Impact Assessment (EIA) for this project was approved in June 2009 by the Department of Environment (DOE).
- ③ Anti-Pollution Measures: measures will be taken for air quality, water quality and noise by constructing tall stacks and wastewater treatment facilities, planting trees and installing soundproof walls, so the project is expected to meet the emission and environmental standards of the country. Meanwhile, cooling water will be taken from the neighboring river, but the amount of water to be taken will be small even in dry seasons as the cooling water is cyclically used in the coolant tower, so the impact on the river flow is expected to be minimal.
- ④ Natural Environment: this project site is located outside nationally and locally designated protected areas (National Reserves and Conservation Areas), and so adverse impact on the natural environment is assumed to be minimal.
- ⑤ Social Environment: this project requires land acquisition and resettlement of two retail shops for gas pipelines and transmission cables, which will be carried out in accordance with the domestic procedures of Bangladesh. The project requires no resettlement of any residents.
- ⑥ Other / Monitoring: the executing agency will monitor the progress of land acquisition, the environment, air quality, drainage and underground water during construction and provision of service. It will also monitor the quality of public water resources, noise and other neighboring environments after the facilities start operation.

2) Promotion of Poverty Reduction: none

3) Promotion of Social Development: as part of the consulting services of the project, HIV/AIDS preventative programs will be conducted for construction workers during the construction period.

(8) Collaboration with Other Schemes and Donors

Pipeline to supply gas to the power plant is under construction under an ADB assistance project (to be completed in 2013).

(9) Other Important Issues

The introduction of a highly efficient gas combined cycle reduces greenhouse gas emissions and thus contributes to alleviation of the climate change. The effect of the project to alleviate the climate change (in terms of the volume of GHG emissions reduction) is approximately 360,000 tons/year of CO₂ equivalent. A Japanese firm has already received the order for the consulting services for construction of the power plant in this project and has commenced the services. In addition, Japanese firms are highly competitive in EPC contracts for construction of power plants and associated facilities, giving Japanese companies the advantage in obtaining the contract.

4. Targeted Outcomes

(1) Quantitative Effects

1) Performance Indicators (Operation and Effect Indicator)

Indicator		Target (2018) 【Expected value 2 years after project completion】
Maximum output capacity (MW)		360
Plant Load Factor (%)		75
Plant Availability (%)		90
Auxiliary power ratio (%)		3
Gross Thermal Efficiency (%)		52
Outage by cause (hours/year)	Human errors	0
	Machine errors	438
	Planned outage	192
Annual Amount of Net Generation Output (Gwh/year)		2,294

2) Internal Rate of Return

Based on the conditions indicated below, the economic internal rate of return (EIRR) of the project is 19.6% and the financial internal rate of return (FIRR) is 8.6%.

[EIRR]

Cost: project cost (excluding taxes) and operating and maintenance costs

Benefits: earnings from electric power selling based on the estimated electricity wholesale price

Project life: 25 years

[FIRR]

Cost: project cost and operating and maintenance costs

Benefits: earnings from electric power selling

Project life: 25 years

(2) Qualitative Effects

Improvement of industrial competitiveness and living standards of the targeted region as well as the enhancement of mitigation measures against global warming.

5. External Factors and Risk Control

Delay in civil engineering and other work due to floods or other natural disaster, and sustainability of supply of natural gas to the power plant

6. Evaluation Results and Lessons Learned from Past Projects

(1) Evaluation results of similar projects

The ex-post evaluation of Mombasa Diesel Generating Power Plant Project in Kenya has given a lesson that self-reliant efforts of the executing agency and appropriate support from manufacturers will considerably increase the possibility of self-sustainability of the power generation project. The ex-post evaluation of Surabaya Metropolitan Area Communication Network Improvement Project in Indonesia has given another lesson: in order to produce effects of the project that is executed by a governmental agency, it is essential to reform the awareness of officers of the agency and strengthen the internal management structure of the agency by transferring and giving authorities over the operation to the agency.

(2) Lessons for the Project

The NWPGL, the agency responsible for execution of the project, and the operation and maintenance of the power plant, was recently established as a governmental agency. Thus, based on the lessons above, a long-term service agreement (LTSA) will be concluded with manufacturers and other parties concerned, and a consultant will be hired to strengthen the agency's organizational structure with the support of the existing E/S loan.

7. Plan for Future Evaluation

(1) Indicators to be Used

- 1) Maximum output capacity (MW), plant load factor (%), plant availability(%), auxiliary power ratio (%), gross thermal efficiency (%), outage by cause (hours/year) (human error, machine failure and planned outage) and power generating at sending end (Gwh/year)
- 2) EIRR (%) and FIRR (%)

(2) Timing of Next Evaluation: two years after project completion

END