

Ex-Ante Evaluation (for Japanese ODA Loan)

1. Name of the Project

Country: The People's Republic of Bangladesh

Project: Dhaka Underground Substation Construction Project

Loan Agreement: June 29, 2017

Loan Amount: 20,477 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 Power Sector in Bangladesh

The People's Republic of Bangladesh has been experiencing a surge in power demand due to economic growth and industrialization, which has allowed the nation to maintain an annual GDP growth rate of over 6% for the past decade and more. This is evidenced by the fact that peak-time demand for power, which had stood at 4,230 MW in 2005, roughly doubled to 8,920 MW in 2015. It is predicted that the Dhaka Metropolitan Area, in particular, which accounts for approximately 45% of the country's total power demand, will see the local power demand continue to grow by an average of 9% annually in coming years. In Bangladesh, operators routinely conduct a planned power outage with distribution suspension totaling 934 MW for FY2013. The Government of Bangladesh is now engaged in new power development programs with a stated goal of raising the nation's power generation capacity to approximately 21,000 MW by 2020. Meanwhile, experts are now concerned about the reliability of local power supply because many Dhaka-based substations, which are already running at 80% capacity and higher, will find it difficult to transfer its power load to other substations in the event of an accident. Moreover, they are worried that the peak-time demand will exceed local substation capacities within the next six to seven years, which may cause a widespread power outage to occur regularly in the Dhaka Metropolitan Area at peak times. As such, the government must tackle the urgent task of enhancing the equipment in the entire Dhaka area by installing additional substations and taking other measures.

Although there is a need to promptly enhance the equipment for the entire Dhaka area, the government finds it challenging to acquire sites on which to build a substation. This is attributable to the fact that: 1) Being the most crowded city in the world, Dhaka has less than one percent of unoccupied land, according to Dhaka Structure Plan 2015 (the average unoccupied land in major cities in developed countries is 20% to 30%); 2) land prices in the city have been soaring; and 3) land owners in Dhaka are generally reluctant to relinquish their landholdings. Therefore, to strengthen the equipment swiftly, the government is required to expand the power capacity on the premises of existing substations while maintaining the current power supply levels and without putting the substations out of operation.

(2) Development Policies for the Power Sector in Bangladesh and the Priority of the Project
In its 7th Five-Year Plan (FY2016/17–FY2020/21), the Government of Bangladesh set addressing the soaring demand for power as one of its top-priority challenges. In addition to expressing an intention to give prioritized budget allocation to bolster the nation's power generation, transmission and distribution, the government has set an urban development goal of using local land resources more effectively and moderating the soaring demand for housing and urban services.

The Project will newly construct an underground substation beneath an existing substation site without suspending operation by employing techniques used for high-density urban areas in Japan. After completion, the new substation is expected to temporarily substitute the capacities of other existing substations and allow the government to lay the groundwork for boosting the entire power equipment in Dhaka by expanding the existing local substations one at a time. Thus, the project is considered to be an initiative that will achieve the priority policies and development goals advocated by the Government of Bangladesh.

(3) Japan and JICA's Policy and Operation in the Power Sector

The Country Assistance Policy for Bangladesh (June 2012) sets the accelerated economic growth as a priority area and cites power shortage as the biggest impediment to economic development. The JICA Country Analysis Paper for Bangladesh (April 2013) identifies stable power supply as a priority issue and this project is in line with these policies and the analysis.

The major support activities in the power sector in the past include the following:

- Loan: New Haripur Power Plant Development Project (FY2007–FY2008); Bheramara Combined Cycle Power Plant Development Project (FY2010–FY2013); National Power Transmission Network Development Project (FY2013); Matarbari Ultra Super Critical Coal-Fired Power Project I and II (FY2014–FY2016); Dhaka-Chittagong Main Power Grid Strengthening Project (FY2015) and so forth.
- Technical Cooperation: Dispatching Power Sector Adviser (FY2004–present); Strengthening Management and Performance Standards in Power Sector of Bangladesh through Promotion of TQM (FY2006–FY2009); Master Plan Study on Coal Power Development in Bangladesh (FY2009–FY2010); and so forth.

(4) Other Donors' Activity

The Asian Development Bank has been stepping up efforts to provide assistance to the power grid and substation sector in Dhaka with multiple power grid upgrading projects now underway. The French Development Agency is engaged in a substation construction project, while the Asian Infrastructure Investment Bank is assisting substation rehabilitation programs.

(5) Necessity of the Project

This Project is in line with Bangladesh's development challenges and policies, as well as with the assistance policies and analysis of the Government of Japan and JICA. It contributes to the improvement of the local investment environment by delivering an improved balance of supply and demand for power, and to the establishment of a sustainable urban environment by tapping into local land resources effectively. In addition, it contributes to the achievement of three Sustainable Development Goals (SDGs): the seventh goal (Ensure access to affordable, reliable, sustainable and modern energy for all), the ninth goal (Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation), and the eleventh goal (Make cities and human settlements inclusive, safe, resilient and sustainable). Therefore, the necessity for JICA to support the Project is substantial.

3. Project Description

(1) Project Objective

The objective of the Project is to improve electric supply reliability and electric power supply and demand balance by constructing two underground substations in Dhaka, thereby contributing to improvement of investment environment of Bangladesh and nationwide economic development.

(2) Project Site / Target Area

Gulshan and Kawranbazar, Dhaka

(3) Project Components

- 1) Design and construction of underground substation including the transformer cooling system (2 sites: Gulshan and Kawranbazar), cable tunnel for underground transmission line (around the concerned underground substation) and vertical shaft and cable tunnel for distribution line (around the concerned underground substation)
- 2) Design, procurement and installation of electric facilities for underground substation (132/33 kV Gas Insulated Transformer, etc.), underground transmission line (Gulshan: around 3 km, Kawranbazar: around 2 km), distribution line (around the concerned underground substation)
- 3) Consulting Services (e.g., F/S review, basic design, bidding assistance, application of building permit assistance, construction supervision)

(4) Estimated Project Cost (Loan Amount)

31,179 million Yen (Loan Amount: 20,477 million Yen)

(5) Schedule

June 2017 - September 2024 (88 months in total). The Project will be completed when the facilities are put in place (September 2023).

(6) Project Implementation Structure

- 1) Borrower: The Government of the People's Republic of Bangladesh
- 2) Executing Agencies: Dhaka Electric Supply Company Limited (DESCO), Dhaka Power Distribution Company Limited (DPDC)
- 3) Operation and Maintenance System

The operation and maintenance of the Project is provided by DESCO and DPDC

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

1) Environmental and Social Consideration

① Category: B

② Reason for the Categorization: The project is not likely to have significant adverse impact on the environment under the JICA Guidelines for Environmental and Social Considerations (April, 2010) in terms of its sectors, characteristics and areas.

③ Environmental Permit:

The Environmental Impact Assessment (EIA) Report on the project is expected to be approved by the Department of Environment of Bangladesh in June 2017.

④ Anti-Pollution Measures:

With respect to the air quality, water quality, soil condition, noise and vibration, the environmental effects shall be minimized by sprinkling water at work sites in conformity to the nation's environmental and emission standards, developing sewage conduits and septic tanks, and using low-noise and low-vibration machines. After the commencement of service, the newest equipment in operation is not expected to cause any environmental impact such as noise and vibration.

⑤ Natural Environment:

Although there are plans to install underground power grid lines in the vicinity of the Gulshan Lake, an area designated as an Ecologically Critical Area, no environmental impact is likely to occur because the project's designs and work procedures will adhere to the Bangladeshi legal system. The other target areas do not apply to a vulnerable area, such as national park, or its surrounding, and the expected influence on the local natural environment is minimum.

⑥ Social Environment:

The project will likely not involve any land acquisition and resident relocations because the underground substations in question will be installed beneath the site of the existing substation. The Kawran Bazar substation will cause a temporary relocation of street vendors comprising 10 households in the bazar due to a one-time use of nearby streets when constructing the underground substation and power grid line conduits. However, they will be compensated according to the JICA Guidelines for Environmental and Social Considerations as well as to the nation's procedures. No

objections were raised by those households during resident consultations on the project.

⑦ Other/Monitoring:

In this project, the monitoring of air quality, water quality, soil, noise, vibration, etc., during construction and after the commencement of service will be done by the executing agency and contractors. Compensation for temporary relocation prior to the construction will be monitored by the executing agency.

2) Promotion of Poverty Reduction: None

3) Promotion of Social Development: None

(8) Collaboration with Other Donors: None

4. Targeted Outcomes

(1) Quantitative Effects

1) Performance Indicators (Operation and Effect Indicators)

Indicator	Baseline *1 (Actual Value in 2016)	Target (2015) *2 【Expected value 2 years after project completion】
Availability Factor (Gulshan Substation) (%)	86	61
Availability Factor (Kawranbazar Substation) (%)	89	32
Annual Electricity Supply (Gulshan Substation) (GWh)	254.6	1,005.6
Annual Electricity Supply (Kawranbazar Substation) (GWh)	145.8	564.4
Bank Capacity (Gulshan Substation) (MVA)	0	288
Bank Capacity (Kawranbazar Substation) (MVA)	0	288

*1 Baseline is the data of existing substation.

*2 Target will be the data of the substation which will be constructed by the Project.

2) Internal Rate of Return

According to the following preconditions, this project's Economic Internal Rate of Return (EIRR) will be 39.9% at Gulshan Substation and 29.5% at Kawranbazar Substation. The Financial Internal Rate of Return (FIRR) will be 5.6% at Gulshan Substation and 4.4% at Kawranbazar Substation.

【EIRR】

Cost: Project costs (excluding tax), Power purchase costs, Operation/maintenance costs (excluding tax)

Benefit: Increase in power sales and reduction of power loss

Project Life: 50 years

【FIRR】

Cost: Project costs, Power purchase costs, Operation/maintenance costs

Benefit: Power sales, Increase in income by the Reduction of Power Loss

Project Life: 50 years

(2) Qualitative Effects

Improvement of supply and demand balance in Dhaka, Improvement of investment environment of Bangladesh and nationwide economic development

5. External Factors and Risk Control

Delays in civil engineering works due to natural disasters such as a flood and the continuity of power supply to the substation.

6. Lessons Learned from Past Projects

(1) Lessons Learned from Past Projects

The results of the ex-post evaluation (in 2011) of the Construction of 230 kV Underground Transmission Line between Bangkapi and Chidlom Substation Project for the Kingdom of Thailand revealed that when a project involving multiple agencies as stakeholders is implemented in the future, it will be necessary to consider setting up meetings with such parties and have it coordinate closely. This is because the project for the development of underground power transmission tunnels and lines beneath canals in Bangkok involved many agencies including the Bangkok Metropolitan Administration, the Electricity Generating Authority of Thailand, the Bangkok Mass Railway Transit Authority, the Expressway Authority of Thailand and the State Railway of Thailand, and coordination among relevant parties took longer than expected, which was one of the reasons for the project's delay.

(2) Application of Lessons Learned to the Project

The Project will probably have multiple agencies as its stakeholders. Therefore, any implementation delay will be avoided by setting up meetings to facilitate coordination in the planning and design stages for relevant parties such as the Ministry of Power, Energy and Mineral Resources of Bangladesh, Power Grid Company of Bangladesh Ltd., DESCO and DPDC. In addition, we will have meeting participants coordinate closely by periodically sharing information on project designs and issues faced by individual agencies.

7. Plan for Future Evaluation

(1) Indicators to be Used

- 1) Availability Factor (%) , Annual Electricity Supply (GWh), Bank Capacity (MVA)
- 2) Economic Internal Rate of Return (EIRR) (%), Financial Internal Rate of Return (FIRR) (%)

(2) Timing: Two years after the project completion