

Ex-Ante Evaluation (for Japanese ODA Loan)

1. Name of the Project

Country: The Republic of the Union of Myanmar

Project: Urgent Rehabilitation and Upgrade Project Phase I

Loan Agreement: June 7, 2013

Loan Amount: 14,052 million yen

Borrower: The Republic of the Union of Myanmar

2. Background and Necessity of the Project

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

Myanmar's per capita electricity consumption was only 100kWh (in 2011), which was next to Nepal in being among the lowest in Asia. However,, electric demand in Myanmar has been rising rapidly against the background of economic reforms such as attract foreign investment and industrialization. The electrification rate of Myanmar is 26%, which is among the lowest of ASEAN countries alongside Cambodia (approx. 24%). The household electrification rate is 63% in Yangon, the center of the country's economy, followed by the capital city of Nay Pyi Taw (52%), Kayah (37%) and Mandalay (29%). The remaining rural areas are electrified averaging at approximately 16%.

Myanmar is prone to power shortages in dry season (from December to around April) because its electrical power generation relies heavily on hydropower that accounts for more than 70% of total power generation. Therefore, in spite of the increasing share of gas-fired thermal power plants in total power generation in Yangon area during the dry season when the water level is low, the electricity generation capacity of thermal power plants has been confined to about 70% of rated output due to their aged deterioration. Also, there are growing concerns about the emergence of system failures, frequent occurrence of accidents, and increase in technical/non-technical loss, because some of the existing transmission as well as substation facilities are decades-old.

Moreover, although the Myanmar's maximum supply of power is about 1,500 MW (including 700 MW for Yangon area), it is estimated that the potential power demand may exceed 2,000 MW, taking account of the fact that rotating outages are commonly carried out.

It is urgently required to address the issue of insufficient power supply, in view of the expectation that power demand will be expected to grow at around 15% each year along with economic development.

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

In response to planned outages, the Government of Myanmar identifies by repairing the existing power facilities as a major issue of the short-term electricity policy in Myanmar. Meanwhile, on June 21, 2012, President Thein Sein delivered an address at the first meeting of Foreign Aid Management Central Committee headed by himself and consisting of the relevant ministers, saying that electricity was one of the top priorities in need of foreign aids for the social and economic development. The Government of Myanmar acknowledges, too, that measures to eliminate the current power shortage are urgent, putting the repair of the existing power plants at the top of its short-term priority list.

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

Japan's Country Assistance Program for Myanmar (April 2012) identifies "assistance to development of infrastructure and systems necessary for sustainable economic growth" as one of Myanmar's priority area, and this project will contribute to it through an improvement of the electricity supply system in the Yangon area. In this light, the project is consistent with Japan's assistance policy. To date, JICA has implemented various projects in the electricity sector in Myanmar, including "Advisor for Improvement of Electric Supply System in Yangon" to dispatch long-term experts transferring technologies related to power distribution facilities. As for grant aid cooperation, the "Project for Rehabilitation of Baluchaug No.2 Hydropower Plant" is in progress. In the form of ODA loan cooperation, the "Project for Gas Turbine Power Plant in Rangoon" was carried out to build a power plant in the Tharkayta district of Yangon.

(4) Other Donors' Activity

The Asian Development Bank is currently conducting a project to send experts to the country for revisions to electricity-related laws. It has no direct connection with this project.

(5) Necessity of the Project

As stated above, this project is consistent with the development issues and policy of the Government of Myanmar, and Japan and JICA's priority area, so JICA'S assistance for this project is highly necessary and relevant.

3. Project Description

(1) Project Objective

The objectives of the Project are to improve capacity and reliability of the power supply to ease the stringency of power demand by rehabilitating and upgrading power plant and related transmission systems in the Yangon area, thereby contributing to economic development of Myanmar.

(2) Project Site/Target Area

Yangon Region

(3) Project Components

1) Rehabilitation of power plant

- Rehabilitation of major facilities of a power plant (Tharkayta Power Plant)

2) Rehabilitation of substations

- Rehabilitation of four substations (Tharkayta, Ywama, Hlawga and Ahlone Substations)
- Upgrade of 33kV overhead transmission line from Ywama and Hlawga Substations (from 33kV to 66kV)
- Installation of substation control system available for SCADA

3) Consulting services (detailed designing, bidding assistance, construction supervision, monitoring for environmental and social considerations, etc.)

(4) Estimated Project Cost (Loan Amount)

17,548 million yen (Loan amount: 14,052 million yen)

(5) Schedule

June 2013 – January 2019 (68 months). The project will be completed when the facilities start operation (January 2018).

(6) Project Implementation Structure

- 1) Borrower: The Government of the Republic of the Union of Myanmar
- 2) Guarantor: N/A
- 3) Executing Agency: Myanma Electric Power Enterprise, Ministry of Electric Power
- 4) Operation and Maintenance System: Myanma Electric Power Enterprise, Ministry of Electric Power

(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 fall under the category of large-scale projects in the thermal power, and the power transmission and distribution line sectors cited in the JICA Guidelines for Environmental and Social Considerations (published in April 2010). The sector concerned does not fall under the category of sensitive sectors. The project does not have sensitive characteristics, nor is it located in a sensitive area. Thus, its potential adverse impacts on the environment are not likely to be significant.
 - ③ Environmental Permit: Any law of the country does not require an Environmental Impact Assessment (EIA) for this project.
 - ④ Anti-Pollution Measures: The rehabilitation work for the existing thermal power plant and substations under this project is chiefly replacement of instruments involving no civil engineering work, so no serious adverse impact on environment is assumed during the work. When the facilities start to be used for service, it will generate warm drainage water that is used to cool steam of the thermal power plant. But the existing plant adopts a cooling system using a cooling tower that generates less warm drainage water. The rehabilitation work will also improve the efficiency of the plant, so that the amount of warm drainage water per kWh is expected to fall further. As for an impact of harmful matters from the plant on air quality, the rehabilitation work is expected to reduce the amount of emissions per kWh, and the air environment will be monitored, so that any countermeasures will be considered and carried out if it is required in light of the monitoring results.
 - ⑤ Natural Environment: This project is carried out within the premises of the existing electricity-related facilities, so the adverse impact on the natural environment is assumed to be minimal.
 - ⑥ Social Environment: This project concerns rehabilitation of the existing electricity-related facilities and requires neither land acquisition nor resettlement of any residents.
 - ⑦ Other / Monitoring: Myanma Electric Power Enterprise, the executing agency of the project, will conduct measures to ease any adverse effects during construction work and after the commencement of services, and monitor the facilities according to an appropriate plan. Environmental and social consideration experts of the consultant hired in the project will give assistance for monitoring.
- 2) Promotion of Poverty Reduction: N/A
 - 3) Promotion of Social Development (e.g. Gender Perspective, Measure for Infectious Diseases Including HIV/AIDS, Participatory Development, Consideration for the Handicapped etc.): N/A

(8) Collaboration with Other Donors: N/A

(9) Other Important Issues: The rehabilitation of the Tharkayta Power Plant will reduce the CO₂ emissions from the current 709gr/kWh to 556gr/kWh, so the project will contribute to mitigation of the problems of climate change.

4. Targeted Outcomes

(1) Quantitative Effects

1) Performance Indicators (Operation and Effect Indicator)

Indicator	Baseline (Actual Value in 2012)	Target (2020) 【Expected value 2 years after project completion】
Rehabilitation of the power plant		
Maximum output (MW)	64.0	86.0
Availability factor (%)	80.0	90.0
Plant load factor (%)	85.0	85.0
Gross thermal efficiency (%)	28.5	36.3
Net electricity production (GWh/year)	374	565
Rehabilitation of the substations		
Transformer installation capacity(MVA)	763	1,194
Availability factor*1 (%)	82.5	90-100
Transformer electricity Supply (MWh)	912,371	2,466,155-2,740,128
Maximum voltage drop on normal condition (%)	10	10 or less

*1 Availability factor = Maximum load (MW) / [Rating capacity of the facility (MVA) x power factor]

2) Internal Rate of Return

Based on the conditions indicated below, the financial internal rate of return (FIRR) of the rehabilitation of the power plant is 12.3%. As for the substations, since the project chiefly aims to prolong their operating life, the economic internal rate of return will not be calculated.

【FIRR】

Cost: project cost (excluding taxes) and operating and maintenance costs (including the cost of gas fuel)

Benefit: earnings from electric power selling

Project Life: 15 years

(2) Qualitative Effects: Stabilization of domestic power supply and promotion of economic and social development

5. External Factors and Risk Control

N/A

6. Results of Evaluations and Lessons Learned from Past Projects

(1) Results of Evaluation of Similar Past Projects: The ex-post monitoring of the "Project for Gas Turbine Power Plant in Rangoon" in Myanmar has given a lesson for the building of a management, operation and maintenance system of a thermal power

plant: that is, it is essential to provide staff members with training so as to improve their technical level.

(2) Lessons for the Project: In light of the above-mentioned lesson, if necessary, it may be considered the capacity development of operation and maintenance for executing agency, with cooperation of assistance from the consulting services under the project and training courses.

7. Plan for Future Evaluation

(1) Indicators to be Used

1) Rehabilitation of the power plant

- ① Maximum output capacity (MW)
- ② Availability factor (%)
- ③ Plant load factor (%)
- ④ Gross thermal efficiency (%)
- ⑤ Net electricity production (GWh/year)

2) Rehabilitation of the substations

- ① Transformer installation capacity (MVA)
- ② Availability factor (%)
- ③ Transformer electricity Supply (MWh)
- ④ Maximum voltage drop on normal condition (%)

(c) Financial Internal Rate of Return (FIRR) (%)

(2) Timing of Next Evaluation

Two years after project completion