

## Ex-Ante Evaluation

### 1. Name of the Project

Country: Mongolia

Project: Ulaanbaatar Thermal Power Plant No.4 Optimization Project

Loan Agreement: November 15, 2013

Loan Amount: 4.201 billion yen

Borrower: The Government of Mongolia

### 2. Background and Necessity of the Project

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

Power demand is on the rise in Mongolia as a result of the country's dramatic economic growth in recent years, but domestic power generation capacity (approximately 916 MW) is not enough to meet demand, and Mongolia has had to import the shortfall (about 134 MW) from Russia.<sup>1</sup> Power demand is expected to increase approximately 6-7% annually, particularly in Ulaanbaatar, where more than 40% of the population lives,<sup>2</sup> and the Mongolian government has decided to meet this demand by improving the efficiency of existing power plants and developing new power sources. In particular, the Ulaanbaatar Thermal Power Plant No. 4, which has the country's highest production capacity (580 MW) of any of the existing power plants, has been operating for about 30 years now, and is now aging. As a result, a drop in power generation efficiency and unplanned turbine outages have led to an unstable power supply. This has made improving efficiency by upgrading aging equipment and installing new equipment an urgent issue.

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

In the Millennium Development Goals (MDGs) -based Comprehensive National Development Strategy of Mongolia, prepared in 2006, the Mongolian government stated its intention to implement the Program on Integrated Energy System of Mongolia (2007-2040) as one of its power sector development policies for the period through 2015. This refers to the goal of "ensuring a reliable power supply in central and outlying regions through the establishment of a highly reliable power supply system and the adoption of highly efficient new technology." Moreover, the Government Action Plan (2012-2016), approved by Parliament in September 2012, refers to "updating power infrastructure in Ulaanbaatar." As such, raising the power generation efficiency and aspiring to a stable power supply through the Ulaanbaatar Thermal Power Plant No. 4 Optimization Project is consistent with Mongolia's development policies.

<sup>1</sup> Refer to statistical materials of the Energy Regulation Committee of Mongolia (2010).

<sup>2</sup> Refer to ADB "Mongolia: Ulaanbaatar Low Carbon Energy Supply Project Using a public-Private Partnership Model" (2011).

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

In the JICA Country Analysis Paper for Mongolia, “reinforcing Ulaanbaatar’s urban functions” is listed as a priority area, and within this scope, “infrastructure installation and improving urban planning and management capacity” are identified as priority issues. In addition, the Japanese government’s aid policy for Mongolia also refers to “reinforcing Ulaanbaatar’s urban functions” as a priority issue. As such, this project, which focuses on improving the power supply for Ulaanbaatar, is consistent with Japan’s and JICA’s aid policies. Grant aid cooperation (The Rehabilitation Project for the Improvement of the 4th Thermal Power Station in Ulaanbaatar (I) and (II)) was provided over two periods from 1992, during which the pulverized coal supply system was improved, measures were taken to address clogging of the ash handling system, and the hot water system was renovated. In tandem with this, JICA dispatched long-term experts and senior overseas volunteers, repaired facilities, and also took measures to preserve the environment, provided support for operations and maintenance management, and gave advice. In 1995 and 2001, loan assistance was provided to upgrade the pulverized coal combustion system and repair the boiler control equipment (The Rehabilitation Project of the 4th Thermal Power Plant in Ulaanbaatar (I) and (II)).

(4) Other Donors’ Activity

The World Bank has implemented the Energy Sector Project from 2001, in which it supports efforts to reduce power generation loss by Ulaanbaatar’s public power company. In addition, a project to construct electrical power cables has been mentioned as a possibility for 2015.

The Asia Development Bank (ADB) has carried out a feasibility study for the construction of the Thermal Power Plant No. 5 as a private-public partnership. Currently, the contract for the construction work for Phase I (450 MW in power generating capacity) is being negotiated.

In addition, the Kreditanstalt fur Wiederaufbau (Reconstruction Credit Institute) supports projects to repair the cooling tower’s permeation membrane and water pump at the Thermal Power Plant No. 4, and Czechoslovakia provides support for the introduction of an automated control system for the plant’s water purification system.

(5) Necessity of the Project

As noted above, this project is consistent with the issues faced by Mongolia’s power sector and the government’s policy, and is also consistent with Japan’s and JICA’s aid policies. Accordingly, both the need and relevance for JICA’s support for this project’s implementation are high.

<b>3. Project Description</b>
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(1) Project Objectives

This project aims to install new equipment and upgrade existing equipment at the Thermal Power Plant No. 4, which has Mongolia’s highest power generating capacity,

and thereby raise the plant's power generating efficiency and stabilize its power supply. This would contribute to the stable growth of Mongolia's society and economy.

(2) Project Site/Target Area

Ulaanbaatar Thermal Power Plant No.4 in Ulaanbaatar City

(3) Project Components

- 1) Upgrades to turbine governor and distributed control system
- 2) Installation of soot blower
- 3) Upgrade to mill roller of coal pulverizer
- 4) Consulting services (detailed design, bidding assistance, construction supervision, etc.)

(4) Estimated Project Cost

5.035 billion yen (Loan amount: 4.201 billion yen)

(5) Schedule

From November 2013 to June 2020 (total: 82 months). The project completion is defined as the commencement of the service of the facilities.

(6) Project Implementation Structure

- 1) Borrower: The Government of Mongolia
- 2) Executing Agency: Ulaanbaatar Thermal Power Plant No.4
- 3) Operation and Maintenance System: The Project Implementation Unit (PIU), which will be in charge of managing this project's implementation at the Thermal Power Plant No. 4, will be established under the jurisdiction of the first deputy director cum chief engineer.

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

1) Environmental and Social Consideration

(i) Category B

(ii) Reason for Categorization:

This project does not qualify as a large-scale project in the thermal power generation sector, as described in the JICA Guidelines for Environmental and Social Considerations (issued in April 2010), and its negative impact on the environment would not be significant. Moreover, the project does not have any characteristics that would magnify any impact nor is it located in a region likely to be affected, as outlined in the Guidelines.

(iii) Environmental Permit:

An Environmental Impact Assessment (EIA) Report for this project is not required by Mongolian law.

(iv) Anti-Pollution Measures:

Adequate measures will be taken so that the asbestos used in the existing boiler do not drift when the soot blower is set up, and the waste materials generated during construction are properly transported and disposed of.

(v) Natural Environment:

The area targeted in the project is not an area that would tend to be affected, such as a national park, nor is it in the surrounding area, and thus the negative impact on the natural environment is expected to be minimal.

(vi) Social Environment:

Since this project will be carried out completely within the site of the existing Thermal Power Plant No. 4, the project does not involve land acquisition or resident transfers.

(vii) Other/Monitoring:

The Thermal Power Plant No. 4 will monitor the appropriate disposal of asbestos dispersed in the course of this construction project.

2) Promotion of Poverty Reduction: None

3) Promotion of Social Development (e.g. Gender Perspective, Measure for Infectious Disease including HIV/AIDS, Participatory Development, Considerations for Persons with Disabilities, etc.): None

(8) Collaboration with Other Donors: None

(9) Other Important Issues: None

#### 4. Targeted Outcomes

(1) Quantitative Effects

1) Performance Indicators (Operation and Effect Indicator)

Indicators	Baseline*	Target (2022) (Expected value 2 years after project completion)
Boiler capacity utilization rate (%)	73.6	74.9
Turbine capacity utilization rate (%)	77.1	80.5
Boiler outage times due to equipment malfunction (hours/year)	1,245	1,132
Turbine outage times due to equipment malfunction (hours/year)	1,267	967
Transmission end electrical energy (GWh/year)	2,395	2,621

\*As the annual fluctuation of the past figures for these indicators is significant, the benchmarks are the averages during the period from 2007 to 2011.

2) Internal Rate of Return: based on the conditions indicated below, the economic internal rate of return (EIRR) of the project is 26.8% and the financial internal rate of return (FIRR) 4.0%.

[EIRR]

Cost: project costs (excluding taxes), operation, maintenance and management costs (fuel and other)

Benefits: Effect in cutting costs compared to the import of electricity from Russia

Project life: 25 years

[FIRR]

Cost: Project costs, operation, maintenance and management costs

Benefits: Higher revenue resulting from increase in electricity revenue

Project life: 25 years

(2) Qualitative Effects

Improved power generation efficiency, stabilization of power supply, reductions in global warming gas emissions due to cuts in amount of coal and heavy fuel oil used in activation

## 5. External Factors and Risk Control

None

## 6. Lessons Learned from Past Projects

The ex-post evaluation results for The Rehabilitation Project of the 4th Thermal Power Plant in Ulaanbaatar (I) and (II) demonstrate that setting appropriate electrical rates is important in ensuring the project's financial sustainability. In this project as well, despite repeated requests to the regulatory agency for an increase in the electrical rate, the Mongolian government has only approved a modest rate increase, which hurts the financial status of this project. Accordingly, we plan to collaborate with other donors to convince the Mongolian government to appropriately revise electrical rates and heating rates for the sustainable development of the electrical sector overall. In addition, we plan to consider the aid needed to improve the financial management capacity of the Thermal Power Plant No. 4 by dispatching experts through Technical Assistance related to Japanese ODA Loan.

## 7. Plan for Future Evaluation

(1) Indicators to be Used in Future Evaluations

- 1) Boiler capacity utilization rate (%)
- 2) Turbine capacity utilization rate (%)
- 3) Boiler outage times due to equipment malfunction (hours/year)
- 4) Turbine outage times due to equipment malfunction (hours/year)
- 5) Transmission end electrical energy (GWh/year)
- 6) Economic Internal Rate of Return (EIRR) (%)
- 7) Financial Internal Rate of Return (FIRR) (%)

(2) Timing for Next Evaluation

Two years after project completion