

Ex-Ante Evaluation (for Japanese ODA Loan)

**Central Asia and the Caucasus Division, East and Central Asia Department,
Japan International Cooperation Agency**

1. Basic information

Country: The Republic of Uzbekistan

Project: Electric Power Sector Capacity Development Project Phase 2

Loan Agreement: December 19, 2019

2. Background and Necessity of the Project

(1) Current State and Issues of the Electric Power Sector in Uzbekistan and Position of this Project

The population of the Republic of Uzbekistan (hereinafter "Uzbekistan") is approximately 32.39 million and GNI per person is 2,020 US dollars according to the World Bank (2018). Since Uzbekistan produces abundant natural gas and coal, thermal power generation is the main power source in the country, accounting for approximately 80% of the total power, followed by hydro-power generation that takes approximately 20%. Natural gas power generation, in particular, accounts for 75% of the total power supply in Uzbekistan as the main power. The electric power demand in Uzbekistan has been increasing in line with the stable economic growth, and is expected to steadily increase also in the future due to economic growth and other reasons. The maximum electric power demand in 2018 was 10,420 MW and it is expected to be 17,000 MW in 2027 (Joint Stock Company Thermal Power Plants, 2019).

In addition, the operation of natural gas thermal power plants in the country, which generate approximately 90% of the total thermal power generation capacity, started in the former Soviet Union era and thereby they are aging. Therefore, the gross power efficiency is in a low level at approximately 30% and increase in the fuel consumption has been contributing to major environmental impact. The International Energy Agency reported that the greenhouse gas emissions in Uzbekistan were in the highest level in the world due to its use of the aging and in-efficient power plants.. Therefore, the Uzbek government needs to introduce renewable energy, promote energy saving measures, and improve the power generation efficiency of natural gas thermal power plants, which are the base load power in Uzbekistan.

With the afore-mentioned factors as a background, in recent years the Uzbek government has been introducing high-efficiency gas turbines into thermal power plants in the country. As part of such projects, the government has been installing six new high-efficiency combined cycle gas turbines (CCGTs) and one cogeneration system

made by Japanese manufacturers since 2013. At the power generation plants that are the core of power supply, to keep the operation highly efficient and safe, appropriate operation, maintenance, and management, including replacing main parts in periodic inspections to be performed once every one to two years, are essential. However, Uzbekistan is short of funds and human resources for operation, maintenance, and management under the present conditions and thereby no self-sustained maintenance system has been established. Periodic inspections are not always carried out properly at appropriate times.

The Electric Power Sector Capacity Development Project (Phase 2) (hereinafter, “this project”) aims at enhancing the capacity to establish a medium- to long-term operation, maintenance, and management system while carrying out proper operation, maintenance, and management at appropriate times at existing gas thermal power plants. Even though the Electric Power Sector Capacity Development Project (loan agreement in 2015, 3 billion yen) partially assists the Uzbek government in operating, maintaining, and managing one gas thermal power plant unit (Navoi Thermal Power Plant unit 1), this project will expand the scope of target power plants and equipment and provide the necessary funds and technical assistance for the operation, maintenance, and management until a self-sustained operation, maintenance, and management system is established at target power plants in order to promote reforming the Electric Power Sector.

The Uzbek government determined to work to improve the access to power through modernizing existing power plants and constructing new ones as a preferential task in the "Five-Area Development Strategy for 2017-2021." The Development Strategy also aims at reducing the consumption of natural gas and other fuels by improving the power generation efficiency. Therefore, this project is regarded as a project with high priority.

(2) Japan's and JICA's Policy for the Electric Power Sector and Position of this Project

This project aims at increasing the power supply and improving the power generation efficiency, which are challenges in Uzbekistan. This project matches the Uzbek government's development policies and Japan's and JICA's cooperation policies and analysis, and contributes to SDGs goal 7 (energy) and 9 (strong infrastructure). Therefore, supporting this project is considerably meaningful.

The Development Cooperation Policy for Uzbekistan (March 2017) defines the renovation and development of economic infrastructure (for transportation and energy) as a priority area and JICA country analysis paper for Uzbekistan (updated in December 2014) also highlights development of economic infrastructure especially for

transportation and power sector as a priority area, which is consistent with the objective of this project.

Japan has been assisting Uzbekistan in constructing new gas thermal power plants in the Navoi Thermal Power Plant Modernization Project (loan agreement in 2013, 34.8 billion yen) and Turakurgan Thermal Power Plant Construction Project (loan agreement in 2015, 71.8 billion yen). Japanese companies received the orders for the two projects. In addition, the Japanese government has been supporting the construction of a cogeneration plant as the Tashkent Thermal Power Cogeneration Plant Construction Project (loan agreement in 2015, 12 billion yen) (a tender is being prepared). In addition, the Electric Power Sector Capacity Development Project with a Japanese ODA loan (loan agreement in 2015, 3 billion yen) provided funds for procuring spare parts and technical advisory service required to operate, maintain, and manage Navoi Thermal Power Plant unit 1.

In addition, Japan has been assisting Uzbekistan in developing training courses and systems for staff who operate, maintain, and manage gas thermal power generation at the Navoi Thermal Power Plant through a technical cooperation project named Project for Establishment of the Combined Cycle Gas Turbine (CCGT) Operation and Maintenance Training Center (2015 to 2019). This project will also provide training on operation, maintenance, and management provided at the training center which was established with the support of the technical cooperation project.

(3) Other Donors' Activity

Asian Development Bank (ADB) supported infrastructure development such as the Tallimarjon Thermal Power Plant Construction Project in co-financing with JICA. ADB also assisted the Uzbek government in formulating the Energy Sector Master Plan and is supporting to enhance the collection rate of electricity charges by introducing smart meters around the country in a project. The World Bank (WB) has been assisting Uzbekistan in projects for updating 220-kV class power transmission lines and promoting energy-saving investment. In addition, WB and ADB have been working on social and economic reform through providing the Development Policy Loan, for example, by privatizing national enterprises including the Electric Power Sector: WB loaned 500 million US dollars and ADB loaned 300 million US dollars for development.

3. Project Description

(1) Project Objectives

The objective of this project is to establish a safe and self-sustained operation, maintenance, and management system of the existing power plants by upgrade equipment and supply of spare parts and capacity development of operation and maintenance personnel, and thereby, contribute to the high efficient and reliable power generation in Uzbekistan.

(2) Project Site/Target Area: Entire Uzbekistan

(3) Project Details

This project is applicable to a sector loan since target power plants will be selected based on demand for funds for operation, maintenance, and management and the necessity of human resource development with the objective of enhancing the operation, maintenance, and management capability of the thermal power generation section in the Uzbekistan's Electric Power Sector. The executing agency will develop an Implementation Plan (IP) in the implementation phase and decide sub-projects after obtaining concurrence t by JICA. Sub-projects will be selected mainly considering the following selection criteria: 1) Degree of contribution to development in Uzbekistan, 2) relationship and linkage with past Japanese ODA projects, 3) maturity of sub-projects, and 4) technical appropriateness. They should contribute to enhancing the operation, maintenance, and management system in the Uzbekistan's Electric Power Sector and human resource development as preconditions. Current candidates of sub-projects and operations are as listed below.

- i) Upgrade of equipment in periodic inspections, provision of spare parts, and dispatching of technical advisors
- ii) Introduction of remote monitoring systems and human resource development
- iii) Consulting services (tender assistance, procurement supervision, and support for the formation of operation, maintenance, and management plans and for the development of operation, maintenance, and management staff)

(4) Estimated Project Cost (Loan Amount): 45,431 million yen (loan amount: 36,621 million yen)

(5) Project Term: December 2019 to December 2026 (total 85 months). The project will complete by the end of December 2026.

(6) Project Implementation Structure

- 1) Borrower: The Government of Republic of Uzbekistan
- 2) Executing Agency: Joint Stock Company Thermal Power Plants
- 3) Implementing Agencies: Joint Stock Company Navoi Thermal Power Plant, Joint

Stock Company Turakurgan Thermal Power Plant, and Joint Stock Company
Tashkent Thermal Power Cogeneration Plant

(7) Collaboration with Other Projects and Organizations and Division of Roles

1) Japan's Assistance

- Navoi Thermal Power Plant Modernization Project (loan agreement in 2013, 34.8 billion yen)
- Turakurgan Thermal Power Plant Construction Project (loan agreement in 2015, 71.8 billion yen)
- Tashkent Thermal Power Cogeneration Plant Construction Project (loan agreement in 2015, 12 billion yen)

2) Assistance by Other Organizations: None

(8) Environmental and Social Consideration / Cross Cutting Issues / Gender
Classification

1) Environmental and Social Consideration

Category C

The sub-projects will be determined during implementation stage, and it is expected that the sub-project that has a serious and undesirable impacts on the environment and society will not be selected, because this project will provide the necessary equipment and human resource development of the existing power plants and construction work, land acquisition, involuntary resettlement will not be caused.

2) Cross Cutting Issues: None

3) Gender Classification: [Not applicable] ■GI (gender mainstreaming needs survey and analysis project)

[Reasons for classification] Gender mainstreaming needs were surveyed and considered for this project. However, it was determined that no specific activity that would contribute to gender equality and female empowerment would be conducted.

(9) Other Important Issues: None

4. Targeted Outcomes

(1) Quantitative Effects

1) Outcomes (Operation and Effect Indicators)

In the selection of sub-projects, equipment and services to be covered in this project are to be formally determined for each target power plant. The table below lists the currently supposed indicators.

Indicators	Baseline (Results as of 2019)	Target (2026) (at the time of project completion)
Maximum output (MW)	After sub-projects have been determined, a baseline survey will be carried out to determine indicators for each target power plant.	After sub-projects have been determined, a baseline survey will be carried out to determine indicators for each target power plant.
Availability factor (%)		
Unplanned power outage (Times/Hours) caused by human errors and mechanical errors		
Number of trained Technical Advisors for inspection (numbers per year)		

(2) Qualitative Effects: Stabilization of power supply, improvement of the energy efficiency, and promotion of stable life of the citizens through activation of industries and stable power supply

(3) Internal Rate of Return:

After sub-projects have been determined, the internal rate of return will be calculated for each target power plant based on the preconditions listed below. The preconditions may be revised after sub-projects have been determined.

[FIRR]

This project is to support the maintenance of the existing power plants and thereby does not generate additional financial inflow, so FIRR will not be calculated.

[EIRR]

Cost: Operation, maintenance, and management costs (excluding taxes)

Benefits: Power sales revenue that will be possibly lost if this project is not implemented due to decreased operating rate.

Project life: 20 years

5. Preconditions and External Factors

(1) Preconditions: None

(2) External Factors: None

6. Lessons Learned from Past Projects and Application to this Project

In the Electric Power Sector Capacity Development Project (previous phase of this project) in Uzbekistan, a gas turbine for Navoi Thermal Power Plant unit 1, which the Uzbek government installed on its own budget, was inspected and repaired, necessary parts were replaced, and spare parts were supplied. The conclusion of the long-term

service agreement on the provision of spare parts for periodic inspections and dispatching technical advisors contributed, to some extent, the establishment of the base for periodic inspections and the stable power supply with high reliability, .

Meanwhile, periodic inspections sometimes are not carried out at appropriate times due to adjustment based on power supply and demand, preparation in Uzbekistan, and other causes. These facts have taught us that it is desirable that a medium- to long-term operation, maintenance, and management plan should be formulated by Joint Stock Company Thermal Power Plants and each power plant and support should be provided in accordance with the plan. This project encourages each power plant to formulate a medium- to long-term operation, maintenance, and management plan by enhancing its capacity through consulting services. This project also encourages each power plant to carry out periodic inspections properly at appropriate frequency and times by improving the financial conditions of each power plant and enhancing its managing capacity through a technical cooperation project.

7. Evaluation Results

This project aims at increasing the power supply and improving the power generation efficiency, which are challenges in Uzbekistan. This project matches the Uzbek government's development policies and Japan's and JICA's cooperation policies and analysis, and contributes to SDGs goal 7 (energy) and 9 (strong infrastructure). Therefore, supporting this project is considerably meaningful.

8. Plan for Future Evaluation

(1) Indicators to be Used in Future Evaluations

The items in (1) to (3) in 4

(2) Next evaluation

Post-project evaluation: When the project completes

End