Japanese ODA Loan

Ex-Ante Evaluation (for Japanese ODA Loan)

1. Name of the Project

Country: The Republic of Uzbekistan
Project: Navoi Thermal Power Station Modernization Project
Loan Agreement: August 22, 2013
Loan Amount: 34,877 million yen
Borrower: The Government of the Republic of Uzbekistan

2. Background and Necessity of the Project

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

Uzbekistan's peak power demand reached 8,020 MW in 2012. The nation has a total rated power generation capacity of 12,033 MW, but power generation facilities throughout the country are aging, and the peak generation capacity of facilities within Uzbekistan is only around 7,400 MW. The power supply is extremely unreliable, with planned power outages even in the capital city of Tashkent during winter (the peak demand season). Thermal plants generate approximately 90% of all power, but many of these facilities were put into operation 40 to 50 years ago or earlier, and are now deteriorating. The nationwide average peak supply capacity has fallen by approximately 30%, and there is an urgent need to update these facilities in order to secure an adequate power supply and improve reliability. The low average thermal efficiency of the country's thermal power plants (around 30%) also causes a major environmental impact. Against such a background, there is demand for the installation of high-efficiency power generation facilities in order to reduce the nation's CO_2 emissions, which are the world's highest per unit of GDP (among the 65 countries whose emissions figures were published in the 2010 World Development Report). Uzbekistan urgently needs to carry out energy efficiency improvements throughout its economic and societal systems.

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

To secure safe, reliable and equal access to power for all users, the "Law on Electric Power Industry" in 2009 (which defines the basic structure and direction of Uzbekistan's power sector) stipulates that the government should prioritize the introduction of market principles in power generation, transmission and distribution, the attraction of overseas capital to enable the renovation and modernization of power generation facilities, and the improvement in fuel and power usage efficiency. The country's five-year medium-term investment plan and individual annual investment plans

define specific development approaches and critical requirements. The Navoi Thermal Power Station modernization project (hereinafter referred to as "the Project") is included within the 2012 and 2013 investment plans.

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

Japan's Country Assistance Policy for Uzbekistan (April 2012), defines the renovation and development of economic infrastructure (for transportation and energy) as a priority area, and JICA country analysis paper (July 2012) also highlights development of economic infrastructure especially for transportation and power sector as a priority area, which is consistent with the objective of the Project. As for the past Japanese ODA loan projects in the electricity sector, there were two projects; the Tashkent Thermal Power Plant Modernization Project (24,955 million yen) and the Talimarjan Thermal Power Station Extension Project (27,423 million yen).

(4) Other Donors' Activity

The World Bank has been supporting the project related to the power sector efficiency such as the Talimarjan Transmission Project and Advanced Electricity Metering Project. The Asian Development Bank also sees the energy sector as a priority area, and has provided assistance for the Talimarjan Thermal Power Station Extension Project (with co-financing from JICA), Advanced Electricity Metering Projects, a power transmission line project and other initiatives.

(5) Necessity of the Project

As the Project is in response to Uzbekistan's development issues and is in line with its development policies as well as Japan's assistance policy, there is a high level of necessity and validity to JICA's support for the Project.

3. Project Description

(1) Project Objectives

The Project aims to improve energy efficiency and power supply reliability, by replacing obsolete equipment at the Navoi thermal power station and installing a gas combined cycle co-generation power plant, thereby contribute to sustainable economic development, reduce the amount of use of natural gas and emission of carbon dioxide.

(2) Project Site/Target Area: Navoi, southern Uzbekistan

(3) Project Components

1) Engineering work, equipment procurement and other considerations

(i) 431 MW power generation equipment (CCPP, generators, heat recovery steam generator) and related equipment (cooling towers, gas compressors, etc.) (international competitive bidding)

(ii) Power transmission line relocation (out of Japanese ODA loan component)

2) Consulting services (detailed design, bidding assistance, construction supervision, etc.) (Short-list method)

(4) Estimated Project Cost (Loan Amount)

53,195 million yen (Loan amount: 34,877 million yen)

(5) Schedule

From August 2013 to April 2020 (total: 81 months). The Project completion is defined as the commencement of the service of the facilities (May 2018).

(6) Project Implementation Structure

1) Borrower: The Government of the Republic of Uzbekistan

2) Executing Agency: The State Joint-Stock Company "Uzbekenergo"

3) Operation and Maintenance System: The State Joint-Stock Company "Uzbekenergo"

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

1) Environmental and Social Consideration

(i) Category A

(ii) Reason for Categorization: The Project falls under the thermal power generation sector under the "JICA guidelines for environmental and social considerations" (issued in April 2010).

(iii) Environmental Permit: The Project's environmental impact assessment report was approved in February 2012 by the State Committee of the Republic of Uzbekistan for Nature Protection (Goskompriroda).

(iv) Anti-Pollution Measures: In consideration of air quality, the use of natural gas (which has low sulfur content), low-NOx combustion appliances and high stacks at the plant is expected to enable compliance with Uzbek emissions standards. With regard to wastewater, the Project will involve the use of the forced-draft cooling tower system, which recycles cooling water. As the existing unit (which is based on a once-through cooling system that produces large amounts of heated water discharge) will be shut down, the Project's implementation is expected to reduce heated water discharge by approximately 28,000 m^3/h. Waste products will be handled in accordance with Uzbek law, with sludge being disposed of in specified landfills and waste oil being consigned to specialist disposal companies. In terms of noise countermeasures for the construction phase, low-noise machinery will be used, machinery and vehicles will undergo periodic maintenance and inspection, and construction work will not be performed at night. Noise reduction measures to be employed after the plant becomes operational include low-noise device usage, soundproofing cover installation and periodic maintenance and inspection. Local residents have not voiced any notable opposition to the Project.

(v) Natural Environment: The area in which the Project will be carried out is not in sufficient proximity to national parks or similar land to have adverse effects on such resources. Any negative impact on the natural environment is expected to be minimal.

(vi) Social Environment: The relocation of power transmission towers within the Project area will require the acquisition of approximately 3.11 ha of land and the forced relocation of 23 households (93 people). Land acquisition and resident relocation will be performed in accordance with Uzbek procedures and Land Acquisition and Resettlement Action Plan. Residents of ten households illegally possess houses and other buildings still under construction within the planned acquisition area, and the Executing Agency will pay compensation based on re-acquisition costs for their lost assets.

(vii) Other / Monitoring: During the Project's construction phase, EPC contractors will monitor air quality, river water quality, noise, waste products and complaints. After the commencement of the service of the facilities, work will be conducted at the Navoi Thermal Power Station to monitor air quality, gas emissions, wastewater and river water quality, noise, waste products and complaints. The Executing Agency will coordinate with the Land Acquisition and Resettlement Committee established by the local government and with resident relocation consultants, and will monitor the progress of residents' relocation and their lives after the move.

2) Promotion of Poverty Reduction: none

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

(8) Collaboration with Other Donors: none

(9) Other Important Issues: Climate change will be mitigated via the deployment of high-efficiency co-generation CCPP (expected CO_2 emission reduction: 684,150 t per year). Once the Project is complete, existing units 3 and 8 will be shut down.

4. Targeted Outcomes

(1) Quantitative Effects

1) Performance Indicators (Operation and Effect Indicator)

Indicators	Baseline (2011)		Target (2020) (Expected value 2 years after project completion)
Operation indicators	Unit 3	Unit 8	CCPP unit 2
Maximum power output (MW)	132	138	431
Maximum heat output per unit time (Gcal/h)	0	33	200

Plant load factor (%)		78.0	82.0	86.8
Auxiliary power ratio (%)		-	-	3.2
Availability factor (%)		93.9	81.9	91.3
Gross power efficiency (power generation + heat supply) (%)		-	-	72.3
Outage hours per cause (hours/year)	Human errors	0	0	0
	Machine errors	296	442	240
	Planned outage	240	1,146	600
Effect indicators				
Annual net power output (GWh)		1,059	945	3,171
Annual net heat output (Gcal)		0	66,000	1,520,000

2) Internal Rate of Return: based on the conditions indicated below, the economic internal rate of return (EIRR) of the project is 16.76% and the financial internal rate of return (FIRR) 7.34%.

[EIRR]

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

Benefits: increased power supply, increased heat supply, reduced natural gas consumption, reduced CO_2 emissions

Project life: 30 years

[FIRR]

Cost: Project costs, operation, maintenance and management costs

Benefits: power sales revenue, heat sales revenue

Project life: 30 years

3) Greenhouse gas reductions: expected CO_2 emission reduction of 684,150 t per year

(2) Qualitative Effects: promotion of national and regional economic development

5. External Factors and Risk Control

Destabilization of natural gas supply to Navoi Thermal Power Station, natural disasters

6. Lessons Learned from Past Projects

(1) Results of Evaluation for Similar Projects: The ex-post evaluations of Tunisia's Rades Thermal Power Station Project points out that due to lacked personnel in general and staff with sufficient expertise for plant operation, maintenance and management, additional technical instruction was required during the maintenance and management phase, highlighting the importance of planned personnel placement and technical skill development in advance.

(2) Lessons to be applied to the Project: As the CCPP to be installed under the Project is a comparatively new technology for Uzbekistan, consulting services under the project will cover technical transfer through training program formulation as well as implementation in order to enhance operation,

maintenance and management system.

7. Plan for Future Evaluation

(1) Indicators to be Used in Future Evaluations

1) Maximum Power output (MW)
2) Maximum Heat output per unit time (Gcal/h)
3) Plant load factor (%)
4) Auxiliary power ratio (%)
5) Availability factor (%)
6) Gross power efficiency (power generation + heat supply) (%)
7) Outage time per cause (human errors, machine errors, planned outage) (hours)
8) Annual net power output (GWh)
9) Annual net heat output (Gcal)
10) Economic internal rate of return (%)
11) Financial internal rate of return (%)
12) Greenhouse gas (CO_2) emission reduction (t)

(2) Timing of Next Evaluation

Two years after project completion