Japanese ODA Loan

Ex-ante Evaluation

1. Name of the Project

Country: The Republic of Kenya
Project: Olkaria I Unit 4 and 5 Geothermal Power Project
Loan Agreement: March 31, 2010
Loan Amount: 29,516 million yen
Borrower: Kenya Electricity Generating Company Ltd.

2. Background and Necessity of the Project

(1) Current Status and Issues of the Electricity Sector in Kenya

The total power generation capacity in the Republic of Kenya (hereinafter referred to as Kenya) is 1,375 MW, of which hydroelectric power stations are responsible for 761 MW (approx. 55%). The country relies on hydropower generation for over 70% of its total annual output. With the good economic growth of recent years, demand for electricity in the country has increased by around 5% annually and demand at peak times reached 1,079 MW in FY 2008. Power shortages have worsened since 2007 due to the impact of major draughts which occurred in three consecutive years. Rolling blackouts have been in operation since August 2009. Therefore, the development of new power sources has become an urgent issue in order to promote a stable power supply in the country. In Kenya where natural resources are in short supply, geothermal development has been conducted since the 1970s as an alternative energy to hydroelectric and thermal power generation. Since the Olkaria I Geothermal Power Station started operating in 1981, geothermal power plants with a total capacity of 165 MW have been developed.

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

The "Vision 2030," which is a long-term development plan announced in 2008 as a national development plan for Kenya, set the overall goals of achieving high living standards, international competitiveness and economic prosperity by 2030. The plan has three pillars namely "economic," "social" and "political" pillars. It aims at achieving "sustained economic growth of 10% per annum," "a just and cohesive society enjoying equitable social development in a clean and secure environment" and "issue-based, people centred, results oriented and accountable democratic political system." The electricity sector is seen as one of the infrastructures which support the three pillars and the plan stipulates that the country will strive to secure the electricity needed to maintain growth, improve the electrification rate in rural areas and improve the electricity services in urban areas, among other efforts. Specific power development is implemented based on the Least Cost Power Development Plan (LCPDP). The latest version of the plan is the "LCPDP 2009-2029" and it clarifies the investment plan which integrates imported electricity into the plan, as well as the development plan for a wide variety of power sources and transmission lines. The Olkaria geothermal development is defined as a top priority project in the plan.

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

The Project matches Japan's Country Assistance Program for Kenya, which sets forth the "development of economic infrastructure" as a priority area and that it will assist "the development of energy resources to relieve the shortage of power indispensable for the country's industrial activities, giving full consideration to conservation of the

environment and the impact on the lives of residents." In the Fourth Tokyo International Conference on African Development (TICAD IV), the Yokohama Declaration set forth the policy, "promotion of the use of clean energy and improvement of energy access" in Sub-Saharan Africa. JICA's policy on assisting the electricity sector in Kenya is to strengthen support for the development of new power sources including the utilization of renewable energy, etc., and for the development of domestic and transnational transmission lines, in order to further contribute to the promotion of a stable power supply in Kenya and neighboring countries. Kenya is one of the few countries in Sub-Saharan Africa which continued debt repayments without receiving debt relief and continued receiving ODA loans. Japan has provided ODA loans to the electricity sector of the country through the Mombasa Diesel Generating Power Plant Project (approved in March 1995), the Sondu/Miriu Hydropower Projects (approved in March 1997 and February 2004) and the Sondu-Miriu Hydropower Project Sang'oro Power Plant (approved in January 2007).

(4) Other Donor's Activity

Other main donors for the electricity sector in Kenya include the World Bank, the French Development Agency (AFD), the European Investment Bank (EIB), the German Credit Institute for Reconstruction (KfW) and the African Development Bank and they provide comprehensive assistance including power source development, the development of power transmission and distribution systems, the electrification of rural areas, the improvement of organizational management capabilities for electricity-related organizations and others. The World Bank, AFD, EIB and KfW have assisted with construction and expansion projects at the Olkaria II Geothermal Power Station.

(5) Necessity of the Project

In Kenya where the power shortage problem is intensifying day by day, the promotion of a stable power supply indispensable for economic activities is an urgent issue in order to maintain the good economic growth that has been seen in recent years. The geothermal power station to be expanded by the Project will abate the tight supply/demand balance in the country. The Project also matches Japan and JICA's aid policies because it reduces emissions of air pollutants and CO2 when compared to operating a thermal power plant of the same size, by utilizing renewable energy. The provision of an ODA loan for the Project is, therefore, very necessary and relevant.

3. Project Description

(1) Project Objectives

The purpose of the Project is to abate the tight supply/demand balance and promote a stable power supply in the country through the construction of Units 4 and 5 (70 MW x 2 units) at the Olkaria I Geothermal Power Station in the Rift Valley Province, thereby contributing to the economic development of the country through the improvement of the investment climate. The Project also contributes to reducing the impact on the global environment as it promotes the utilization of renewable energy.

(2) Project Site/Target Area

Naivasha District, Rift Valley Province (approx. 75 km northwest of Nairobi)

(3) Project Components

The construction of Units 4 and 5 at the Olkaria I Geothermal Power Station and the construction of relevant transmission lines, etc.

1) Civil works (the construction of power plants, the boring of production wells and reinjection wells, the construction of steam gathering systems, the construction of transmission lines, etc.)
   - Procurement method: International Competitive Bidding
   - Execution method: Contract construction
2) Consulting services (design, tender assistance, construction supervision, etc.)

(4) Estimated Project Cost (Yen Loan Amount)
59,188 million yen (Yen Loan amount: 29,516 million yen)

(5) Schedule
The planned implementation schedule is from March 2010 to November 2014 (57 months in total). The Project will be deemed complete when the facilities begin operating in December 2013.

(6) Project Implementation Structure
1) Borrower: Kenya Electricity Generating Company (KenGen)
2) Guarantor: The Government of the Republic of Kenya
3) Executing Agency: Same as 1).
4) Operation and Maintenance System: Same as 1). However, the Kenya Electricity Transmission Company (KETRACO) will be responsible for the maintenance of transmission lines.

(7) Environmental and Social Consideration/Poverty Reduction/Social Development
1) Environmental and Social Consideration
   a Category: A
   b Reason for Categorization: The Project is categorized as A because its sector and area falls under sensitive power generation sectors and sensitive areas set forth in the JBIC Guidelines for Confirmation of Environmental and Social Considerations (established in April, 2002).
   c Environmental License: The Environmental and Social Impact Assessment (ESIA) report regarding the Project was approved by the National Environmental Management Authority (NEMA) of Kenya on November 27, 2009.
   d Anti-Pollution Measures: The plants will be constructed on site away from villages in order to mitigate the impact of air pollution, noise and vibration during the operation. The diffusion of pollutants will be enhanced by discharging gases from the cooling towers using fans. Villages where pollution is expected to exceed the standard will be relocated based on the resettlement plan formulated by KenGen. In order to maintain water quality, all the hot water will be returned underground.
   e Natural Environment: Rare species have not been found in Hell's Gate National Park where the project site is located. Logging will be minimized and native species will be planted in order to conserve the vegetation in the park. No impact is expected on the water level of neighboring Lake Naivasha because only a limited amount of water will be used from the lake.

   d Social Environment: It is expected that approx. 600 acres of land will be acquired and 33 households will be relocated. The land acquisition and resident relocation will be completed by November 2010 based on the

domestic laws of the country and the resettlement plan formulated by KenGen.

e Other/Monitoring: The executing agency will monitor air and water quality, noise, ecosystems, resident resettlement, etc.

2) Promotion of Poverty Reduction: Jobs will be created during the construction, the running of the facilities, operation and maintenance.

3) Promotion of Social Development (e.g. Gender Perspective, Measure for Infectious Diseases including HIV/AIDS, Participatory Development, Considerations for Persons with Disabilities, etc.): Construction companies are required to take measures to prevent HIV/AIDS infection of construction workers and neighboring residents.

(8) Collaboration with Other Donors: The ODA loan for the Project is co-financed with the World Bank, EIB and KfW.

4. Targeted Outcomes

(1) Performance Indicators (Operation and Effect Indicator)[1]

Indicator		Target (2015) [Expected value 2 years after project completion]
1) Maximum output (MW)		140
2) Plant load factor (%)		93.4
3) Availability factor (%)		96.7
4) Internal consumption rate (%)		4.27
5) Outage hours by cause (hours/year)	• Human error	0
	• Machine failure	240
	• Planned outage	336
6) Net electric energy production (GWh/year)		1,097

(2) Internal Rate of Return

Based on the conditions listed below, the Economic Internal Rate of Return (EIRR) of the Project will be 12.9%, and the Financial Internal Rate of Return (FIRR) of the Project will be 10.6%.

[EIRR]

Cost: Project cost (excluding tax and duty), operation & maintenance cost

Benefit: Reduction of construction cost and operation & maintenance cost for alternative coal-fired thermal power plants

Project Life: 25 years

[FIRR]

Cost: Project cost, operation & maintenance cost

Benefit: Income by selling electric power

Project Life: 25 years

[1] In case of the join-evaluation of the project with 4 other co-financiers, figure of these indicators may change as the co-financiers have different figures than these.

5. External Factors and Risk Control

Project supervision must take into account the involvement of multiple donors including a project on the Olkaria IV to be implemented simultaneously.

6. Lessons Learned from Past Projects

Ex-post evaluations of similar projects in the past have shown the importance of securing steam in order to obtain project effects. Simulations were conducted on the potentials of reservoirs for Olkaria I and IV in the F/S for the Project. The simulations showed that the 185 MW operation is possible for another 25 years at Olkaria I. The availability of steam will not be restricted by steam transactions, either, because KenGen continues to own the right to use the steam in this area although steam obtained by future geothermal development in Kenya will belong to the Geothermal Development Company (GDC).

7. Plan for Future Evaluation

(1) Indicators to be Used

1) Maximum output (MW)
2) Plant load factor (%)
3) Availability factor (%)
4) Auxiliary power ratio (%)
5) Outage hours by cause (hours/year) (human error, machine failure, planned outage)
6) Net electric energy production (GWh/year)
7) EIRR, FIRR (%)

(2) Timing

Two years after project completion