Kenya

Mombasa Diesel Generating Power Plant Project

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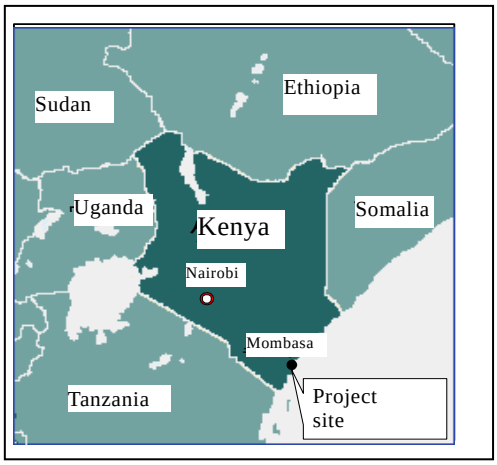
Field Survey: November-December 2005

1. Project Profile and Japan's ODA Loan



Map of project area

View of Kipevu I from a Distance[1]

1.1 Background

Located in the eastern part of Africa and facing the Indian Ocean, Kenya shares borders with Ethiopia, Uganda, Tanzania, Somalia and Sudan. It has an area of approximately 583,000km², which is about 1.5 times the size of Japan, and the population of 32.4 million (2004 World Bank Statistics), roughly equivalent to the combined population of the Tokyo metropolitan area and its three adjacent prefectures of Chiba, Kanagawa and Saitama. In spite of relative progress in industrialization, Kenya remains a predominantly agricultural country with agriculture accounting for 25% of its GDP and 60% of its workforce engaged in this sector. The city of Mombasa is located in the southern part of the country in the Coast Province and is Kenya's second largest city after Nairobi, which boasts the largest trading port in east Africa. Mombasa has a population of about 600,000 and is one of the major tourism destinations, centering on its seaside resorts.

Although Kenya's electric power sector had been given priority as essential infrastructure in the development of industry, suspension of assistance to the country during 1992-1993 had a serious impact. This resulted in the situation that vital in-

[1] The name given to the electricity plant built during the project.

vestment failed to take place, and nationwide electricity shortages grew serious. In 1995, Kenya's overall electric power generating capacity was 780MW (about half of the capacity of Okinawa Electric Power Co., Ltd.) and the country relied on hydropower for 77% of its power generation. With rainfall levels having a significant impact on output, electric power supply plans were put in place to cope with drought periods. However, while demand for electricity was expected to grow at an annual rate of 5%, existing power generation facilities were getting old and nearing the end of their expected lifetime. Therefore, it was necessary to build new facilities to meet increasing in demand.

1.2 Objective

The purpose of the project was to promote the region's potential to cope with the increasing demand for electricity by constructing a power plant with a capacity of 75MW in Kipevu, a suburb of Mombasa, Kenya's second largest city, which plays a particularly important role in the development of the country's industry and tourism, thereby contribute to its economic growth.

1.3 Borrower/Executing Agency: The Republic of Kenya/Kenya Electricity Generating Company, Ltd. (KenGen)

1.4 Outline of Loan Agreement

Loan Amount Disbursed Amount	10,716 million yen 8,719 million yen
Exchange of Notes Loan Agreement	March 1995 March 1995
Terms and Conditions - Interest Rate - Repayment Period (Grace Period) - Procurement	 2.6% p.a. 30 years 10 years LDC Untied
Final Disbursement Date	December 2000
Main Contractor	Mitsubishi Corporation, Mitsubishi Heavy Industries
Consulting Services	Mott MacDonald Ltd.
Feasibility Studies (F/S) etc.	Mott Ewbank Preece (1990) (Currently Mott MacDonald

	Ltd.) (funded by the World Bank)

2. Evaluation Result

2.1 Relevance

2.1.1 Relevance at the time of appraisal

In the National Development Plan (1994-1996), the electric power sector was earmarked as an important sector. The National Power Development Plan, which formed one part of this plan, contained a plan for the future development of power resources (for the period 1994-2013, prepared with the cooperation of the World Bank). Based on this plan, in the Five-year Least Cost Investment Plan (1994-1998, with the support of the World Bank), three projects, including this project, were specified as priority areas for investment over the following five-year period. Mombasa, at the center of the area targeted for the project, is an important city in terms of industry and tourism. Since Kenya's electric power generation facilities on the whole depended excessively on hydropower generation, the city also suffered from an unstable supply of electricity due to planned outages. It was hoped that the project would make a contribution to the area's electric power supply as a base load during dry periods and as a complementary source during peak periods when water supply was plentiful. Therefore, the urgency of the project was strong.

2.1.2 Relevance at the time of evaluation

Overhauling and improving the infrastructure of the energy sector are specified as important inputs in country's economic infrastructure in the Economic Recovery Strategy for Wealth and Employment Creation (2004-2007), the medium-term national development plan established in June 2003, and these improvements are expected to contribute to growth in employment and fiscal revenue. Furthermore, in the Energy Sector Reform Project (1998-2004) and the Energy Sector Recovery Project (2004-2010), the extension and upgrading of power generation capacity are stated as being necessary to provide a stable supply of electricity. Both of these plans are the master plans for the development of the energy sector and were formulated with the assistance of the World Bank as concrete plans under the Five-Year Least Cost Investment Plan,

In view of the diminishing potential for the future development of hydroelectric power generation, geothermal electric power generation takes time and cost.

Moreover, renewable energy sources in generating electricity, such as biomass, solar power, and wind power, have certain limitation in generating capacity. Therefore, diesel thermal power generation, which has a relatively low impact on the environment, holds high importance as a power source to complement hydro-power and geothermal power generation. Furthermore, diesel-powered generators are relatively easy to operate, as it can be started and stopped in a short time. Besides, there are several technical merits by installing of a number of small-scale generators rather than a single unit, such as undertaking repair and maintenance without interruption of the plant operation, sharing spare parts among the units, and using the parts from a generator undergoing maintenance temporarily for a generator requiring parts in the event of an emergency. In view of these merits, the project's relevance remains high.

2.2 Efficiency

2.2.1 Outputs

The project was consisted of the provision of facilities and relevant materials and equipment, civil engineering and construction, installation construction, test operations, and consulting services related to the execution of these, and it was completed according to plan.

Details of the facilities:

- Six medium-speed generator units, each with a capacity of 12,500kW (total capacity of 75MW[2])
- Fuel storage facility
- Water cooling facility
- Air and gas emission equipment
- Waste fuel treatment facility
- Fire prevention equipment
- Substation facilities
- Main transformers
- Extension and connection of existing 132kW switchgear

2.2.2 Project period

According to the original plan, the project period was to run from March 1995

[2] About one sixth of the 440MW output of Kin Thermal Power Station which was completed in February 2003; it is Okinawa's second coal-powered thermal power plant after Gushikawa Thermal Power Station.

to June 1998 for a period of 40 months. However, the project actually went from March 1995 to September 1999 for a period of 55 months, which was 38% longer than the original plan. Factors causing delays in the completion of construction were: (1) a delay in the handover of the site to the contractors by KenGen, the executive agency of the project, (2) a delay in procurement procedures at the time of the pre-qualification audit (PQ), (3) a delay in parliamentary approval of a guarantee by the government of Kenya and a consequent delay in the preparation of a guarantee letter and legal opinion as well as a delay in the effective date of the ODA assistance agreement, (4) a delay in the process of VAT exemption in the government of Kenya, and (5) prolonged construction due to extraordinary rainfall of El Niño.

2.2.3 Project cost

The cost of the project according to the original plan was 12,607 million yen (10,716 million yen of which was the Yen loan portion). However, the actual cost amounted to 9,928 million yen (8,719 million of which was the Yen loan portion), which was 21% less than the original plan. Although local currency depreciated by 11% in comparison with the value at the time of the appraisal, since the contract price went under the estimated amount due to the international competitive bidding. The overall cost of the project was under the initial projection.

2.3 Efficiency

2.3.1 Management and operation of the power plant

The Kipev I thermal power station which was constructed through the project commenced commercial operations in December 1999 and has been operating satisfactorily. However, in January 2003, trouble with the governor (a regulator which keeps the generators' rotational velocity constant) caused abnormal rotations in the engine of Unit No. 2, making it inoperable. Repair of the engine took about two and a half years, and the unit did not resume normal operation until August 2005.

Fig. 1 The six generator units which form the heart of the electric power station

The table below shows trends in the operational performance of the thermal power station Kipev 1 from the time it commenced commercial operations in

1999[3] until 2004. As the figures indicate, maximum output and the availability factor for 2003 and 2004 fell below previous performance levels. However, this was due mainly to the suspension of the operation of Unit No. 2. Unofficial figures at the time of the ex-post evaluation, however, indicate that following Unit No. 2's resumption of normal operation maximum output recovered to a level of 73.5MW[4] and the availability factor to 77.6%.

Table 1. Annual Trends in Operational Performance of the Power Plant

1999	2000	2001	2002	2003	2004
Maximum Output (MW)					
73.5	73.5	73.5	73.5	61.25	61.25
Plant Output (GWh/Year)					
404.6	462.6	277.1	152.6	288.6	338.4
Availability Factor (%)					
90.9	81.9	78.04	69.78	60.32	64.74
Auxiliary Ratio (%)					
2.87	2.91	6.23	5.14	3.30	3.17

Source: KenGen

In the initial period of operation, there were reports of trouble with the generators due to engine vibrations. However, this problem was fixed by KenGen and external supplier, and the generators' availability factor was successfully restored.

2.3.2 Annual outage hours

Annual trends in the number of annual outage hours for every cause in the Kipev I thermal power station are shown in the table below. In many cases the direct cause of outages may be due to mechanical trouble but further investigation shows that the cause was fundamentally due to human error. In classifying the outages by cause below, such causes are classified as "human error" while "mechanical trouble" are entirely due to mechanical failure and do not involve human factors. The trouble with the governor previously mentioned was also upon investigation found to be due to the neglect of a basic operation and this is included in

[3] KenGen's business year is from July 1 to June 30, and the annual figures refer to the business year. For example, the year 1999 refers to the period from July 1, 1999 to June 30, 2000 (the same also applies to tables which follow).

[4] The power plant's rated output is 75MW but due to tropical climate conditions of Mombasa where the plant is located, the maximum output is limited to 73.5MW

the “human error”[5].

Table 2. Trends in Annual Outage Hours by Cause

(Unit: Hours/Year)

Cause	1999	2000	2001	2002	2003	2004
Human Error	-	-	-	4,015	14,600	10,116
Mechanical Trouble	1,039	2,252	2,943	7,729	2,940	3,065
Planned Outage (Periodic Inspection)	1,982	6,860	10,502	4,849	3,353	4,613
Other Causes apart from power generation including transmission, etc.	463	383	6,060	21,894	142	379

Source: KenGen

Following installation of the generators, the supplier provided after service as well as assistance in the operation and management of the equipment. In line with operation and management, the supplier also undertook the appropriate transfer of technology for these purposes. The main reason for the sudden surge in outage hours due to mechanical troubles in 2002 was that the warranty period had expired and engineers had withdrawn from the site. Nevertheless, through the plant’s own efforts, the situation improved and outage hours from the following year onwards were successfully brought back to the former level.

2.3.3 Financial status, economic analysis

The project was a newly established project, so the actual performance and forecast of Kipevu I thermal power station, the project cost, the actual administrative and maintenance costs including variable and fixed expenses and forecasts were all recorded as benefits and costs of the project. Furthermore, the Financial Internal Rate of Return (FIRR) was calculated taking into consideration the entire process of providing electricity generated by KenGen to the end user via the power grid of the Kenya Power and Lighting Company, Ltd. (KPLC), and using KPLC’s retail prices (also taking into consideration the additional charge for the ratio of thermal output) for the electricity charges as well the increase in additional opera-

[5] An attitude of tracing the origin of the problem all the way to the human factor even when the direct cause of the problem is mechanical failure is one of the strength’s of the management which uses failure as the launching point leading to improvement. As detailed in 2.5 Sustainability, KenGen’s strength in autonomous development is also supported by the enthusiastic willingness of management to improve.

tion and management costs incurred by KPLC in transmitting electricity generated by KenGen[6]. The FIRR at the time of the ex-post evaluation was 14%. This was 2.7% above the 11.3% value calculated at the time of the appraisal using the same method. Although KenGen's actual fixed expenses were about four times more than the projection at the time of the appraisal, the utilization factor was 30% more than the previous estimate. Consequently, this resulted in a project cost 22% below the original projection. The underlying assumptions taken into consideration at the time of the FIRR are shown in the table below.

Table 3. Underlying Assumptions at the Time of the FIRR Calculation

Project Life	30 years following completion
Cost	(1) Project construction costs (2) Administrative and maintenance costs involved in the running of the Kipevu I thermal power station (including variable and fixed expenses) (3) Additional administrative and maintenance costs for transmission, etc. by KPLC
Benefit	Actual and forecast electricity sales of the Kipevu I thermal power station applying the KPLC's retail price after taking into account the additional charge for thermal power generation.

On the other hand, the Economic Internal Rate of Return (EIRR) was calculated based on the cash flow which was calculated by applying the electricity unit price from the World Bank to the benefit side as the "customer's willingness to pay" and "the conversion factor" to the cost side and converting it into the economic price. This resulted in an EIRR of 10.1%. Electric power generation costs for thermal power generation are much more expensive than costs for hydropower generation. Since this is not reflected in the "customer's willingness to pay" factor used in the calculation of the EIRR, the EIRR result is less than the FIRR value. At the time of the appraisal, an EIRR was not calculated.

2.4 Impact

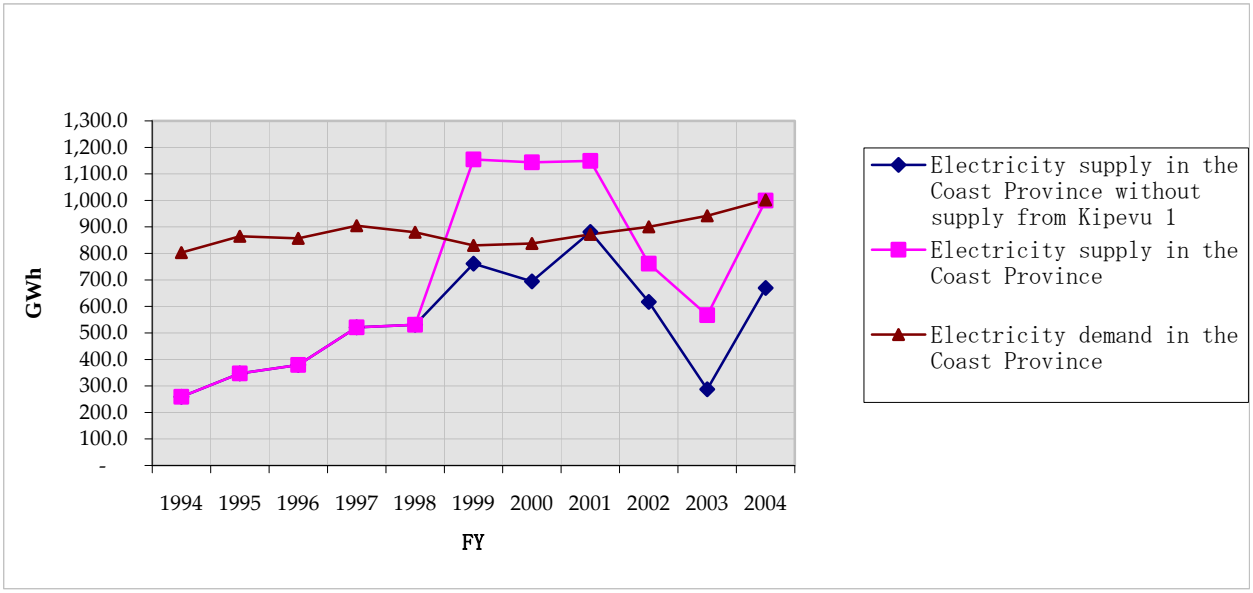
2.4.1 Stable supply of electricity to the region and the entire country

Electric power generated by the Kipevu I thermal power station is meeting the

[6] In this ex-post evaluation, FIRR is calculated and compared based on the same method as the ex-ante evaluation, considering KenGen and KPLC as one unit. The reason behind this is that the government of Kenya sets out the policy to balance the financial status and revenue of KenGen and KPLC. The two companies were split in 1997. However, under the mentioned policy, the government reviewed the financial situation of these two companies and sometimes adjusted the settlement price (trade price from KenGen to KPLC) even after the split, so that their revenues are balanced (please refer to 2.5.1.3).

regional power demand of the Coast Province centering on Mombasa and residual electricity is being exported to other regions through the national grid. The number of KPLC contracts in the Coast Province as of June 2005 was about 78,000 for general households and about 13,000 for commercial use (of these about 500 are large-scale consumption contracts).

Fig. 2 Trends in Electric Power Supply in the Coast Province



Source: Compiled from KenGen data

Fig. 2 shows trends in electricity supply and demand in the Coast Province. According to the figure, in 1999 when the Kipev I thermal power station commenced operation, supply exceeded the Coast Province's demand and signaled the region's transition from an importer of electricity due to electricity shortages until then to an exporter of electricity in the region. The decrease in supply from 2002 shown on the table was due to the outage of generator Unit No. 2 as well as a temporary fall in output by Independent Power Producers (IPPs) in the region as a result of a drought period, which will be mentioned later, after Kipev 1 was in full operation.

The Kipevu I thermal power station is not only making a significant contribution to the improvement of the region's electricity supply as mentioned above but is also making a notable contribution in assisting the country to cope with nationwide electricity shortages. Thanks to Kipev I, power outages in the city of Mombasa from December 1999 were resolved entirely and planned outage hours were

also reduced in the capital Nairobi. The timely startup of the operation of Kipevu I also rescued the country from an electricity crisis during the 2001-2002 drought; that had a serious impact on the electric power sector which is particularly dependent on hydropower for the generation of electricity. It is believed that without the existence of the Kipevu I thermal power station at the time, the economic and social fallout the country sustained would have been much more severe due to the shortage of electricity.[7]

2.4.2 Results of a survey of the beneficiaries

Fig. 3 Resort Hotel of a Large-lot Electricity Customer

As explained above, the contribution of the Kipevu I thermal power station went beyond the Coast Region to the entire country. Its most notable contribution, however, was in stabilizing the electricity supply to companies of the region. The stable supply of electricity is a matter of life or death for businesses. This is particularly so for production activities of companies which are large consumers of electricity, such as hotel management, the cement industry and rolled steel, which are the region's core industries. In a questionnaire survey which included interviews of 33 companies that are large-lot consumers of electricity, the target companies were asked about the quality of service in terms of the stable supply of electricity since 2000 when the Kipevu I thermal power station commenced full operation in comparison with service prior to that time. The categorization of industry of these 33 companies is shown in Figure 4:

Fig. 4 Categorization of Companies under the Beneficiary Survey (33 Companies)

[7] World Bank, Energy Sector Recovery Project: Implementation Completion Project (June, 2005).

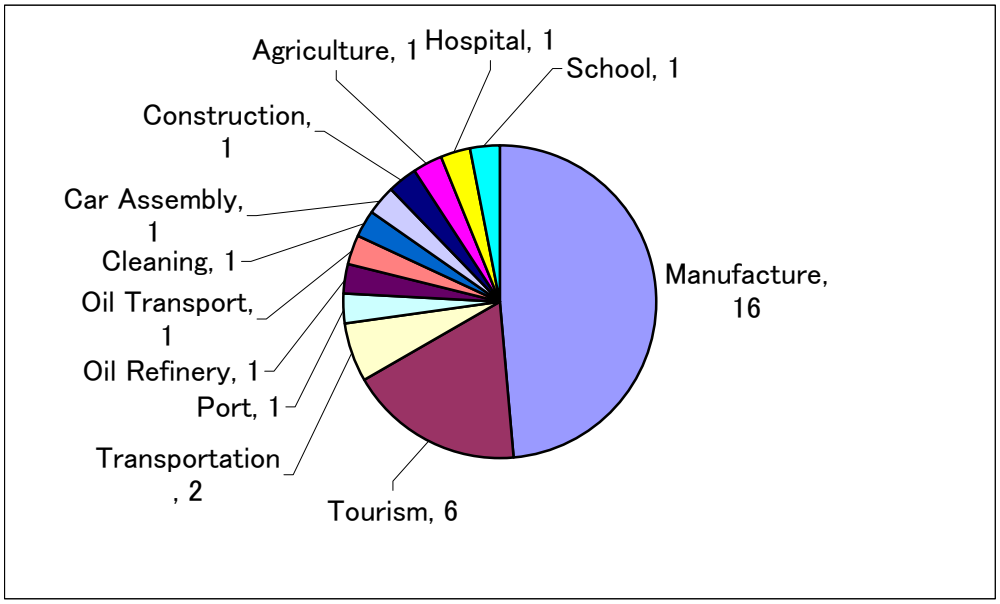


Table 4. Responses from a Survey of the Project's Beneficiaries

Much Improved	Improved	No Change	Worsened	Not Sure	Total
8 Companies	19 Companies	3 Companies	1 Company	2 Companies	33 Companies
24%	58%	9%	3%	6%	100%

Source: Results of the Survey of Beneficiaries

According to the survey, there were many troubles, such as mechanical problems, production loss (for manufacture) and claims from customers, due to unstable power supply before the power plant went into operation. After the commencement of operation, however, 82% responded that the troubles indicators, like frequency of power outage, voltage fluctuation and inappropriate voltage level, have been reduced. In a case of manufacturing company, for example, the electric power problems happened 118 times in 1998, but it was reduced 64 times in 2001. Also the production loss in 2001 was 80% less than that of 1998. Hence, it can be said that Kipevu 1 thermal power plant has brought a positive impact to the improvement in the production capacity of regional business.

2.4.3 Impact on the environment

The Kipevu group[8] of power plants, which includes the Kipevu I thermal power station, undergoes periodic environmental audits by the Electricity Regulatory Board (ERB). The ERB is an independent public agency which was established in 1998 under the Electric Power Act that went into force in 1997. It has a mandate to exercise control across a broad area of the electricity sector. In addition to the regulation of environmental, health, and safety aspects of the industry, it is also responsible for matters ranging from the resolution of claims from electricity consumers to the promotion and control of private sector introduction into the industry and the review and adjustment of electricity charges. According to the environmental audit report prepared by the ERB in 2004, the Kipevu plants had no noticeable negative impacts on the environment. In addition to assessing the impact of electric power plants on the environment, the ERB makes recommendations in its environmental assessment for the improvement of the environmental management systems of the electric power plants. The Kipevu plants are making efforts to bring about improvement by implementing those recommendations. Recommendations for improvement indicated in last year's audit were as follows:

(1) Construct a storage shed for used oil and conduct soil quality monitoring.
(2) Post appropriate emergency and warning signs in all emergency exits and hazard-prone areas. Prepare disaster plans and enforce safety regulations and adequate provision of safety equipment.
(3) Conduct monitoring of noise and vibration.
(4) Commence effluent water quality assessment.
(5) Strengthen environmental information dissemination and communication through training, publications, and education of employees to improve employee awareness.
(6) Maintain a safe operating environment by keeping the workplace clean and tidy.
(7) Promote environmental conservation activities within the electric power plant and surrounding areas.
(8) Continue to contribute to and participate in activities that benefit the local community.
(9) Strengthen the plant's capability in undertaking internal environmental audits.

2.5 Sustainability

2.5.1 Executing agency

2.5.1.1 Technical capacity

[8] Located in the Kipevu area of Mombasa, the group consists of a gas turbine electric power plant, a steam electric power plant and the diesel electric power plant constructed through the project.

Kipev I thermal power station was Kenya's first diesel power plant, and although technical weaknesses in operations and management were evident in the early stages, technical capability improved remarkedly, thanks to technical support provided by the generator suppliers after service. As Table 2 indicated, the number of outage hours due to mechanical troubles in 2002 suddenly surged from 2,943 hours the previous year to 7,729 hours because the supplier's service period had expired. However, from the following year onwards, efforts made by the plant resulted in maintaining stoppage hours to the 3,000 hour level again. This achievement is one aspect which clearly demonstrates the station's improvement in technical capacity.

Aiming for further technical improvement, the power station has been conducting periodical training. During 2006 it plans to conduct a total of 7.5 months training which will include: 51 days of staff training in the operational area, 40 days of staff training in the area of diesel maintenance and repair including 24 days of overseas training, and two months of overseas training in the area of IT.

2.5.1.2 Structure

The thermal power station Kipevu I which was completed as a result of the project is being operated and maintained by KenGen. Furthermore, the electricity generated by the plant is being sold wholesale to KPLC and then sold retail to the end users via the KPLC's grid. The government's ratio of investment in both electric power companies is shown below.

Table 5. Capital Composition of the Executing Agency and Private Sector

	Government	Private Sector
KenGen	70.0%	30.0%
KPLC	48.4%	51.6%

As stated previously, ongoing reform across the electric power sector is continuing through the support of the World Bank. The components of the Energy Sector Recovery Project which was approved in 2004 are as follows:

(1) Institutional and Capacity Building
(2) Studies and Engineering Services
(3) Power Plant Extension
(4) Distribution Upgrading
- Upgrade of existing and construction of new substations
- Improvement and extension of the power grid

・ Upgrade of SCADA/EMS system

2.5.1.3 Financial status

Trends in the operating results and cash flow of the KenGen are shown in the table below.

Table 6. Trends in KenGen's Operating Results and Cash Flow

(Unit: Millions of Ksh.)

Item	2000	2001	2002	2003	2004
Operating Revenue	15,574	13,488	10,252	9,934	8,754
Operating Expenses	10,628	11,241	6,743	5,788	5,959
Operating Income	4,946	2,247	3,509	4,146	2,795
Non-operating Net Profit/Loss	-1,183	228	-209		
Non-operating Revenue				926	371
Non-operating Expenses				81	740
Ordinary Profit	3,763	2,475	3,300	4,991	2,426
Extraordinary Profit	1,584	-	-	-	-
Extraordinary Losses	-	-	-	1,182	-
Pre-tax Net Income	5,347	2,475	3,300	3,809	2,426
Corporate Income Tax	1,317	772	1,020	1,289	742
Net Income	4,030	1,703	2,280	2,520	1,684
Operating Cash Flow	2,729	-506	3,038	16,520	4,801
Plant Investment Expenditure	4,534	4,166	5,713	17,156	3,269
Financial Rate of Return (Net)	348	5,526	4,015	2,815	-228
Cash Increase/Decrease for the Year	-519	853	1,339	1,397	-2,157
Cash Balance at the End of the Year	-419	434	1,774	3,171	1,014

Source: KenGen Annual Report

Note: With the exception of 2004, all values for each year above were taken from the following year's financial statements. Subsequent adjustments are made to annual reports but values carried forward during the year have not been accurately reflected in the figures.

The drought that gripped Kenya from 1999-2001 severely impacted upon the KPLC's financial position with damages sustained on two accounts: in addition to a significant decline in sales due to economic stagnation, there was also a sharp increase in electric power generation costs due to a water shortfall for hydropower generation. In 2003, the government came to the rescue, making financial adjustments to the electric power sector by putting in place the following measures:

(1) It wrote off KPLC's account payable to KenGen (Ksh. 12,260 million) by transferring the amount to KPLC's capital account.

(2) It wrote off KenGen's loans to the government (Ksh. 15,560 million) which KenGen was unable to repay due to a cash shortfall resulting from the inability to recover KPLC's account payable. As above, the government did this by transferring the loan amount to KenGen's capital account.

(3) It gave KPLC a 25% reduction in KenGen's wholesale electric tariffs.

However, these measures were one-off measures for dealing with an emergency situation in abnormal conditions, and operating performance and cash flow conditions improved from 2004 onwards. Due to the reduction in wholesale tariffs mentioned above, KenGen's sales for 2004 show a decreasing trend but an ordinary profit of 28% was achieved and operating performance is favorable. Furthermore, there are plans to lift the 25% reduction in the abovementioned wholesale tariffs, which is only a temporary measure, and KenGen's financial position can be expected to improve further. Its cash flow shows that KenGen has left behind the austere financial conditions experienced up until 2001 as reflected in the unstable financial position due to the drought. While the 2004 reduction in sales tariffs and the purchase of treasury securities (Ksh. 3,416 million) again resulted in a fall in the cash balance, operating cash flow (Ksh. 4,732 million) is covering capital investment spending for that year (Ksh. 3,268 million) and operating performance and cash conditions can be said to be favorable.

2.5.2 Operation and maintenance

Individual mechanical problems noted in the project completion report submitted by KenGen in January 2002 such as troubles with the boiler system, the storage tank, and the control system, etc. were almost all resolved at the time of the ex-post evaluation. However, the following technical problems relating to the following issues were indicated by the electric power plant side at the time of the field survey:

(1) Although there are no outstanding problems in the power plant operations at the moment, the water-cooling radiator is not working properly.

(2) The Distributed Control System (DCS) which centrally controls the operation of the six generator units and which has an estimated lifetime of five

years has passed its functional lifetime, and there is risk of a functional failure occurring.

The supplier's technical opinion in response to the comments of the above equipment is that neither of the two are likely to cause significant problems in the operation of the power plant. However, at the time of the supplier's local visit planned in 2006 as part of the service contract, the supplier plans to consult with the power plant side on technical issues.

Fig. 5 Administration buildings at the power plant

KenGen, including Kipevu I completed during the project, is a holder of ISO900:2000 certificate which guarantees quality of output (electricity) to meet the customers' demands, an appropriate organizational framework (system) to produce the quality of the output, and satisfactory level of environmental management. This fact objectively ensures the sustainability of this project.

3. Feedback

3.1 Lessons Learned

This project is an integral part of the power system expansion in Kenya's comprehensive power sector development that includes construction of new plants, rehabilitation of power distribution facilities and capacity building of KPLC and KenGen, which are stipulated in the Five-Year Least Cost Investment Plan. Project effects were demonstrated through KenGen's capable operation and management of the facility as well as effective cooperation with the KPLC, ERB, and other key institutions in the power sector in the area of environmental regulations, setting electricity charges and adjustment of finance structure of the sector. The project was able to demonstrate outstanding results was due not only to the improvement of infrastructure resulting from the construction of generation and transmission systems, but also through the synergy achieved with the strengthening of the operation and management of the power sector as a whole including the various agencies involved in implementing and operating the systems.

The output of Kipevu I declined for a period due to a breakdown of one of the generators and other technical troubles. However, the subsequent establishment of a framework for technical cooperation with the supplier and its effective implementation resulted in strengthening the KenGen's management capability in operation, maintenance and management. Self-efforts of the executing agency of the project together with the effective support of the supplier side considerably enhance the sustainability of the generation business.

Comparison of Original and Actual Scope

Item	Plan	Performance
(1) Output	・ Six medium-speed generator units, each with a capacity of 12.500kW (total capacity of 75MW) ・ Fuel storage facility ・ Water cooling facility ・ Air and gas emission equipment ・ Waste fuel treatment facility ・ Fire prevention equipment ・ Substation facilities ・ Main transformers ・ Extension and connection of existing 132kW switchgear	According to plan
(2) Project Period	March 1995-June 1998 (40 months)	March 1995-September 1999 (55 months)
(3) Project Cost Foreign currency Local currency Total Yen loan Portion Exchange rate	 10,372 million yen 2,235 million yen (Ksh. 1,248.59 million) 12,670 million yen 10,716 million yen 1Ksh ＝1.79 yen (as of 1994)	 8,719 million yen 1,290 million yen (Ksh. 675.1 million) 9,928 million yen 8,719 million yen 1 Ksh = 1.99 yen (as of 1999)