

Document of
The World Bank

FOR OFFICIAL USE ONLY

Report No. 1230

PROJECT PERFORMANCE AUDIT REPORT

on

KENYA: KAMBURU HYDROELECTRIC POWER PROJECT
(LOAN 745-KE)

July 14, 1976

Operations Evaluation Department

This document has a restricted distribution and may be used by recipients only in the performance of their official duties. Its contents may not otherwise be disclosed without World Bank authorization.

PROJECT PERFORMANCE AUDIT REPORT

KENYA: KAMBURU HYDROELECTRIC POWER PROJECT (LOAN 745-KE)

TABLE OF CONTENTS

Page No.

HIGHLIGHTS

PROJECT PERFORMANCE AUDIT BASIC DATA SHEET i
SUMMARY PROJECT PERFORMANCE AUDIT MEMORANDUM 1-2

ANNEX A

Attachment:

PROJECT COMPLETION REPORT

1-15 Basic Information A.1
16. Project Description (Original). A.2
17. Project Description (Actual). A.3
18. Objective and Justification of the Project. A.3
19. Construction Schedule and Problems Encountered. A.3
20. Cost of Project A.4
21. Rate of Return A.4
22. Consultants A.5
23. Organization and Management A.5
24. Financing A.6
25. Summary of Financial Results. A.8
26. Supervision A.9
27. Auditors A.9
28. Useful Lessons Arising from the Project A.9

Annexes

- 1 - Original and Final Cost Estimates
- 2 - Allocation of Proceeds of Swedish Credit and Bank Loan
- 3 - Actual Annual Sales of kWh and Maximum Demand Compared with Estimates at Appraisal
- 4 - TRDCL: Comparative Balance Sheets
- 5 - TRDCL: Comparative Income Statement
- 6 - TRDCL: Comparative Funds Statement
- 7 - Comparative Combined Balance Sheets
- 8 - Comparative Combined Income Statement
- 9 - Comparative Combined Funds Statement

Map

PROJECT PERFORMANCE AUDIT MEMORANDUM

KENYA: KAMBURU HYDROELECTRIC POWER PROJECT
(LOAN 745-KE)

HIGHLIGHTS

The Bank has made two loans to the Tana River Development Company Ltd. of Kenya. The present loan, which was the first of the two, was intended to partially finance the foreign exchange costs of a hydro station and associated transmission lines. The construction of the dam, power house, and transmission lines posed no unusual problems. The project was completed as planned and start-up problems were minor.

The following points may be of special interest:

Training program and the use of expatriate personnel
(PCR para. 23);

Possibility of providing, in the cost estimates, for
extended construction periods (PCR para. 28).

PROJECT PERFORMANCE AUDIT BASIC DATA SHEET

KENYA: KAMBURU HYDROELECTRIC POWER PROJECT (LOAN 745-KE)

Amounts (in US\$ mln)

	Original	Disbursed	Cancelled	As of 2/29/76	
				Repaid	Outstanding
Loan 745-KE	23.0	23.0	nil	.5	22.5

Project Data

	Original Plan	Revisions	Actual or Est. Actual
	Conception in Bank	-	-
Board Approval	5/71	-	6/1/71
Loan Agreement	-	-	6/7/71
Effectiveness	9/30/71	11/1/71	12/23/71
Physical Completion	2/74	-	7/74
% of original project actually completed by that date	95%	-	100%
Loan Closing	6/75	12/75	2/76
Total Costs (US\$mln) ^{1/}	37.5	-	40.8
Incr. Fin. Rate of Return	16%	-	21%

Mission Data

	Month, Year	No. of Weeks	No. of Persons	Manweeks	Date of Report
Identification	7/69				
Preappraisal	9/69	1	1	1	10/69
Appraisal	3/70	3	3	9	5/71
Special Mission	10/70	1	3	3	10/27/70
Subtotal		5	7	13	
Supervision I	9/71	1.5	1	1.5	10/71
Supervision II	4/72	1.5	2	3.0	6/72
Supervision III	11/72	1.0	2	2.0	1/73
Supervision IV	9/73	1.0	2	2.0	10/73
Supervision V ^{2/}	9/74	2.0	4	8.0	n.a.
Subtotal		7		16.5	

Follow-on Project

Loan 1147-KE of US\$ 63.0 mln, signed July 25, 1975 for Gitaru Hydroelectric Project.

^{1/} Excluding interest during construction.

^{2/} Includes appraisal of Gitaru Hydroelectric Project.

PROJECT PERFORMANCE AUDIT MEMORANDUM

KENYA: KAMBURU HYDROELECTRIC POWER PROJECT
(LOAN 745-KE)

1. This memorandum is an audit of results under the Kamburu Hydroelectric Project, for which Loan 745-KE of June 1971 to the Tana River Development Company Ltd. (TRDC) of Kenya, of US\$ 23 million equivalent was fully disbursed in February 1976. It is based on the corresponding Project Completion Report (PCR) herewith attached, with which there is no fundamental disagreement, on Bank files and on discussions with Bank staff who had participated in the appraisal and supervision of the project.
2. The electricity supply industry in Kenya comprises the East Africa Power and Lighting Company Ltd. (EAP&L) which was created in 1922, the Kenya Power Company Ltd. (KPC) which was created by EAP&L in 1955 principally to finance the interconnection with Uganda and sell to EAP&L the imported power, and the Tana River Development Company Ltd. (TRDC) which was created by EAP&L in 1964 to develop the potential of the Tana River. EAP&L purchases the entire output of KPC and TRDC, and is the sole distributor of electrical energy in Kenya. The Government is the major shareholder of EAP&L and has acquired all the shares of KPC and TRDC. TRDC operates two hydro stations, Kindaruma and Kamburu, which, taken together, accounted for 37% of the country's installed capacity in 1974.
3. The Bank has extended two loans to TRDC, of which the first, the one reviewed here, was to cover 72% of the foreign exchange costs of a hydro station with an initial capacity of 60MW (two 30 MW units), and associated transmission lines. The project was built substantially as planned except for the transmission line to Nairobi which was constructed at 275 KV instead of the 220 KV originally planned. At appraisal, it was expected that an existing 132 KV line between Kindaruma and Nairobi would be uprated to 220 KV (not to be financed under this loan), but this plan was abandoned, and it was decided -- with the Bank's concurrence and at negligible real cost -- to increase the voltage of the new line to 275 KV to enable it to carry the expected load. The project was completed five months late mainly due to unforeseeable rock conditions, and cost 9% (excluding interest during construction) more to build mainly because of currency fluctuations and the extended construction period.
4. Actual sales of energy during the 1971-74 period increased on the average by 9.4% annually compared to the 9% originally envisaged. Actual maximum demand was also very close to the appraisal forecast during this period, so that, in retrospect, the timing of the two units was about right. Although Kamburu, which is being used for base-load, was completed about half a year behind schedule, the interconnected system (comprising 99% of the total installed capacity in 1973, of which 29% was hydro, 58% thermal and 13% was imported from Uganda) did not need to shed any load during the early part of 1974 mainly because the system has a higher than required reserve margin (63 MW in 1973 and 113 MW for 1974, the largest unit in the system being 30 MW, see Annex A).

The EAP&L system is rapidly growing, but the present apparently high reserve margin is being reviewed.

5. At appraisal, the Kamburu hydro station at \$390 per KW installed (1970 price level and including the third unit) was compared with a thermal development and found to be the least-cost solution in providing the increased capacity required by mid-1974. The world-wide increase in fuel prices since appraisal has reinforced this fact, and the actual cost of the project in current value at \$440 per KW installed (only \$366 at 1970 price level) is now expected to yield a rate of return of 21% on its incremental investment compared to 16% at appraisal mainly because of the tariff increase in 1974. Without the tariff increase, the actual rate of return would have been 13.4%.

6. The financial performance of TRDC on a combined basis with KPC and EAP&L during the 1971-74 period was satisfactory. The covenants were adhered to (only in 1973 did the rate of return on net fixed assets fall slightly below the 9.5% required mainly due to operating expenses exceeding forecasts by about 20% for that year). The three companies together financed 34% of their construction program during 1971-74 by internal cash generation as compared to 37% expected at appraisal. 8% was financed by the Swedish International Development Authority (SIDA) and 29% by the Bank, compared to estimated values of 11% and 36% respectively.

7. Supervision missions, about one a year, proved to be an adequate and economical way of dealing with a project of this nature. Fifteen months elapsed between appraisal and loan signing mainly because of difficulties in reaching agreement on the future structure of the Kenyan power sector, and on the financing plan. Lack of coordination between Kenya and Uganda in their development programs was also a factor delaying the start of the project. However, the Bank did play a positive role in getting the project started. The project was well planned and the sales and maximum demand forecasts turned out to be very accurate.

EAP&L SYSTEM

	Installed Capacity 1/ (MW)	Firm Capacity (MW)	Maximum Demand (MW)	Sales (Gwh)	Productive Capability (Gwh)			
					Hydro Average Year	Dry Year	Thermal and Imported	Total Average Year
<u>Forecast</u>								
1971	206	146	131	677	350	280	730	1080
1972	206	146	143	738	350	280	730	1080
1973	218	158	156	804	350	280	730	1080
1974	274	214	170	876	650	520	730	1080
<u>Actual</u>								
1971	216	145	131	715	318	280	875	1193
1972	211	140	146	795	374	280	852	1226
1973	224	151	161	860	387	280	942	1329
1974	284	208	171	925	820	520	942	1762

1/ Including 30 MW imported from Uganda.

PROJECT COMPLETION REPORT

KENYA

LOAN No. 745-KE

KAMBURU HYDROELECTRIC PROJECT

1. Borrower - Tana River Development Company Limited
2. Guarantor - Republic of Kenya
3. Amount of Loan - US\$23 million
4. Date Loan Signed - June 7, 1971
5. Effective Date - December 23, 1971
6. Closing Date - June 30, 1975; due to a few minor works and to delayed payments, the loan closing date was postponed to December 31, 1975. The last sums were disbursed in February 1976
7. Period of Grace - 4 years
8. Term of Loan - 25 years
9. Interest Rate - 7-1/2%
10. Commitment Charge - 3/4 of 1%
11. Fiscal Year - Calendar Year
12. Exchange Rate - US\$1 = Sh 7.14; till October 1975
8.25 from November 1975
13. Appraisal Report No. & Date - 627(a)-KE/May 18, 1971
14. Amortization - Payment is made through semi-annual installments beginning July 1, 1975 and ending July 1, 1996
15. Joint Financing - Jointly financed with SIDA (US\$6 million equivalent)

16. Project Description (Original)

The Project comprises the construction of the Kamburu hydroelectric power station together with the associated transmission lines and substations. The principal features of the Project are described below:

A. Civil Works

- i) A rock-filled dam with a height of 52 meters and a crest length of 730 meters. The dam is built at the confluence of Tana and Thiba rivers. It incorporates an upstream water proofing layer of asphaltic concrete and creates a seasonal storage reservoir with a capacity of 123 million cubic meters. The spillway section is constructed of concrete and has four gates;
- ii) A reinforced concrete intake upstream from the dam with a headgate controlling the flow into the concrete lined intake shaft. The shaft turns through 90° at its foot where a steel lined tunnel leads to a three branch manifold connecting to the individual main inlet valves and associated turbines;
- iii) A surge chamber comprising an inclined tunnel which combines with the power house access tunnel 200 meters from the power station;
- iv) An underground power house with associated underground and surface works. The main access to the station is through an unlined road tunnel; and
- v) A tailrace tunnel 3040 m long (unlined excepting for sections passing through less sound rock) leading into a short (70 m) open cut to the river.

B. Electrical and Mechanical

- i) Two 30 MW generators with Francis type turbines together with ancillary electrical and mechanical equipment. The estimated average annual production of these two units will be 315 GWh. When the third 30 MW unit is commissioned, the average production of Kamburu Power Station will reach a level of some 355 GWh;
- ii) An 11/132/ 220 kV electrical substation; and
- iii) A 220-kV single circuit transmission line from Kamburu to Nairobi (105 km) and a 132-kV single circuit transmission line from Kamburu to the Kindaruma hydroelectric station (15 km).

17. Project Description (Actual)

The Project was carried out broadly in accordance with the original project description. The transmission line to Nairobi, after consultation with the Bank, was erected at 275 kV instead of 220 kV as originally planned. Also during the detailed design, the number of the spillway radial crest gates was reduced from four to three, the spillway location moved from the left to the right Bank.

18. Objective and Justification of the Project

Additional generating capacity was needed to meet the developing load and the Kamburu Project represented the least cost method of providing the additional capacity. The next best alternative (a thermal power plant burning fuel oil from Mombasa refinery) would have been even more expensive than initially computed, due to the subsequent fuel price increases.

The demand forecast carried out during the appraisal period was very accurate and actual consumption figures were equal to or slightly higher than the forecast (see Annex 3). The 275-kV transmission line (initially operating at 132-kV) was necessary to convey the power to the Nairobi area where the main consumption is located; the 132 kV line was necessary to interconnect Kamburu with the existing Kindaruma power station for flexibility of operation. These objectives have been achieved.

19. Construction Schedule and Problems Encountered

The main civil works contractor was Zublin-Zschokke a German/ Swiss consortium; turbines and generators were supplied by Ingra of Yugoslavia, and construction of the transmission line was carried out by BICC of the United Kingdom. All these contractors performed satisfactorily and the only critical factor of substance which arose during construction was an area of fault encountered during excavation of the tailrace tunnel. This slowed down progress and was the principal reason for the delay of five months in commissioning the power plant. Other important works of the Project on which time was lost are the spillway, intake and Kamburu substation. There were problems with tower foundations and erection during the construction of the transmission line but these were of little consequence and, with ample "lead" time, did not result in any serious delay in completion of construction. The plant went into commercial operation during July/August 1974, some five months behind the scheduled target dates of February 1974 for the first generating unit and March 1974 for the second unit.

Teething troubles have been minor and the overall standard of workmanship was excellent. Due to these factors, as well as to the abnormally high flow into the reservoir during the 1974 dry season, the two generators operated at their full rated capacity for some months after they went into service.

The only exception to the generally high standard of completed works was the switchgear which was supplied by ICPP of India. This is not up to normal standard and could be a source of future trouble. After discussions with the manufacturers, remedial actions have been taken, but some of them can be fully implemented only during the erection works for the third unit in 1976.

There was a small leakage (about 1500 litres/minute) in the membrane area of the deep section of the dam. This leakage has since been virtually eliminated by tipping suitable material onto the foundation immediately upstream of the deep river section of the dam. Also serious damage to the bottom of the stilling basin, caused by tumbling rocks was revealed during the first inspection shutdown in November 1974. This has been repaired. Other minor teething troubles were principally with the passenger lifts, the spillway gates and control system, telemetry and transformer oil leaks.

20. Cost of Project

Project costs excluding interest during construction increased by about 9%. The final cost is US\$41 million (foreign cost US\$27.7 million) compared with the appraisal estimate of US\$37.5 million (foreign costs US\$26.1 million) excluding interest during construction. There was a decrease, however, in interest during construction (US\$3.7 million, compared with the appraisal estimate of US\$5.2 million) and as a result the total project cost, including the interest, increased by only 4%. The principal reasons for the increase in costs were currency fluctuations, particularly the dollar devaluation which increased costs by about US\$3.6 million, the imposition of a Sales Tax during the construction period, and escalation of the cost of supervision and consulting services caused partly by currency fluctuations and partly by the extended period of construction. A comparison of the final project cost with the original estimate, under the principal headings, is shown in Annex 1, and the original allocation of proceeds of the Bank Loan and the SIDA credit under each category, compared with final disbursements, is shown in Annex 2.

21. Rate of Return

The internal financial rate of return for the project is defined as the discount rate at which the present worth of the estimated capital and operating costs of the Kamburu Power Station and of related transmission and distribution plant, over the life of the project, equals the present worth of attributable revenues.

This rate of return has been recalculated on the following assumptions:

- a) The capital costs of Kamburu are based on actual costs for the first two units and on estimated costs for the third unit (not included in the Bank-financed project). The costs of the project related to transmission and distribution extensions are based on EAP&L's forecast annual expenditures

on these items. The dam and other civil works are depreciated over 50 years; the electrical and mechanical plant, as well as the transmission and distribution networks over 30 years. Renewal costs are assumed to be the same as original costs.

- b) Related operating and maintenance annual costs are based on EAP&L's 1975 forecast. It is assumed that they will remain constant after 1978.
- c) The production of Kamburu is assumed to increase gradually, according to consultant's estimates, from 1974 to 1977. It is further assumed that, after 1977, Kamburu will maintain an average annual production of 355 GWh. A K¢ 26.63 revenue per kWh sold, based on revised estimates for 1975, was considered for the purpose of this exercise.

The above assumptions are basically similar to those used in the appraisal reports. However, there are a few differences. In the appraisal report (i) the capital costs included the costs for Kamburu, the associated transmission and distribution networks and the 12-MW gas turbine that was installed in Nairobi; (ii) the main civil works were depreciated over 80 years; and (iii) the revenue per sold kWh was considered to vary from US¢ 3.109 in 1974 to US¢ 3.0 in 1980 and later.

Using these assumptions, the appraisal report indicated a rate of return of 16%. Using the same assumptions as in the appraisal report but with actual project costs instead of estimated costs, the rate of return drops to 13.4%. Using the assumptions mentioned in the present report, we obtain a rate of return of 21%. The higher rate of return, allowing for different assumptions, is mainly due to the higher than forecast sales and tariffs, that more than offset higher capital and operating costs.

22. Consultants

The Project was designed and construction was supervised by Engineering and Power Development Consultants Ltd. (EPDC) of the United Kingdom. Their performance on pre-project field studies and design has been satisfactory and supervision of construction good. They have always been fully cooperative with Bank supervision missions and on the whole their performance at all stages of the Project has been well above average.

23. Organization and Management

The electricity supply industry in Kenya consists of three companies: the Tana River Development Company (TRDC) which is the borrower, the Kenya Power Company (KPC) and the East African Power and Lighting Company (EAP&L).

The Kenyan Government owns the entire equity stock of TRDC and KPC. Since 1970, in accordance with its policy of increasing public ownership of the power industry, the Government has been purchasing shares of EAP&L, as they become available in the market; now, it owns or controls about 60% of EAP&L shares.

KPC was formed in 1955 principally to finance the interconnection with Uganda. TRDC was formed in 1969 to utilize the hydroelectric potential of the Tana River. Both KPC and TRDC sell the electric energy, in bulk, to EAP&L. As EAP&L is the sole distributor and coordinates all sources of electric power and staffs and manages both KPC and TRDC, this section in effect deals with EAP&L organization and management.

EAP&L is a reasonably well-managed utility and is operated in accordance with sound commercial principles. Many of the senior management staff have accumulated good experience in public utilities and EAP&L, as presently staffed, is quite capable of operating the Project efficiently. However, there has been a fairly rapid turnover in senior expatriate staff during the last two or three years. The number of expatriates has fallen from 189 in 1970 to some 120 by mid 1975; this decrease reflects a general trend in the East African countries (for comparison: within the same period, the number of expatriates working with TANESCO, Tanzania's electricity undertaking, has fallen from approximately 150 to 30). Maintaining the establishment at full strength and at the same time avoiding a deterioration in the quality of staff are continuing problems.

There are no quick solutions to these problems and the situation can only be relieved as the establishment becomes progressively more experienced. In the meantime EAP&L will have to rely on expatriates for some years ahead but to a decreasing extent as qualified Kenyans can be trained to replace them. EAP&L has an acceptably well-thought out training program for all grades of professional and technical staff to meet its foreseeable needs and it also operates a well-staffed and equipped residential training school for all grades of staff up to technician level. As a consequence, most of EAP&L's staffing problems should be solved by the early 1980's.

In the meantime, to help in dealing with some of the problems besetting its organization, EAP&L agreed, during the 1975 negotiations for the Gitaru loan, to appoint consultants to carry out a review of its management structure and to implement acceptable recommendations arising therefrom. No consultants have been appointed as yet.

During the whole project construction period, EAP&L staff carefully monitored the performance of and cooperated with the consultants and contractors. This proved particularly useful during the commissioning stage.

24. Financing

Comparison of estimated sources and application of funds with the actual figures from 1970 through 1974 and revised estimates of 1975 for TRDC is given in Annex 6, and for TRDC on a combined basis with KPC and EAP&L is in Annex 9. A summary of those comparisons for the years 1970 through 1975 is given below:

A.7

(Kenya £ million)

	TRDC		TRDC/KPC/EAP&L		Increase (Decrease) Over Estimate
	Appraisal Estimate	Actual 1/	Appraisal Estimate	Actual 1/	
<u>Application of Funds</u>					
Construction: Kamburu I 2/	15.1	15.8	15.1	15.8	.7
Other 3/	3.1	10.8	15.1	28.1	13.0
Total Construction	18.2	26.6	30.2	43.9	13.7
Increase in Reserve and Equalization Fund	.1	.2	.3	.4	.1
Increase (Decrease) in Working Capital	.1	.4	.5	(.8)	(1.3)
Total	18.4	27.2	31.0	43.5	12.5
<u>Source of Funds</u>					
Internal Generation of Funds	6.9	7.7	27.0	28.3	1.3
Less: Debt Service	5.6	5.7	9.8	10.1	.3
Dividends			4.7	5.0	.3
Net Internal Generation	1.3	2.0	12.5	13.2	.7
Disposal of Assets			.1	.5	.4
Increase in Paid up Equity Capital		1.8		1.8	1.8
Repayment of Tanzania Bills of Exchange			1.2	1.2	
Borrowings 4/					
IBRD 745-KE	8.2	8.2	8.2	8.2	
SIDA	2.4	2.4	2.4	2.4	
Other	6.5	12.8	6.6	16.2	9.6
Total	17.1	23.4	17.2	26.8	9.6
Total	18.4	27.2	31.0	43.5	12.5

1/ Figures in the column "Actual" include revised estimates for the year 1975.

2/ Kamburu I expenditure includes interest during construction K£ 1.3 million.

3/ Increase in other construction expenditure and other borrowings is mainly due to Gitaru project.

4/ Equivalent amounts in US\$ are not given in this summary due to change in official rate against the US\$ from KSh 7.14 to KSh 8.25 and fluctuation in rates of other currencies. An amount of about K£ 0.2 million withdrawn from IBRD and SIDA loans in 1976 is included in the borrowings.

25. Summary of Financial Results

The appraisal estimates of the balance sheet, income and expenditure and source and application of funds in respect of TRDC, as well as TRDC on a combined basis with KPC and EAP&L, for 1970 through 1975 and comparison with the actual figures based on the audited accounts to 1974 and revised estimates for 1975 are in Annexes 4 to 9. Because of the peculiar relationship of the two bulk supply companies TRDC and KPC with EAP&L, and the latter being a party to the project agreement for the Kamburu project, it is more significant to consider the financial position of TRDC on a combined basis with the other two companies. The operating results to 1974 and revised estimates of 1975 on a combined basis, as compared with the appraisal estimates, show the following variations:

	<u>% Variation from Appraisal Forecast</u>					
	<u>1970</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>1974</u>	<u>1975</u>
Sales in GWh	+ 4	+ 6	+ 8	+ 7	+ 6	+ 5
Sales Revenue	+ 4	+ 6	+ 8	+ 9	+21	+26
Operating Expenses	+ 9	+10	+14	+20	+31	+37
Net Operating Income	-10	- 5	- 5	-18	+ 1	+ 3

The sales volume, revenue and operating expenses were higher than estimates. Net operating income was lower in 1970 through 1973 mainly due to a higher level of thermal generation than estimated and consequently greater fuel consumption, higher administration expenses, EAP&L having started providing for deferred income tax liability from 1971 and higher provision for depreciation in 1970. The fuel cost increase had its full impact in 1974, but this was substantially compensated by an increase in electricity revenue provided by charging EAP&L's customers a fuel surcharge to cover the bulk of the increased fuel cost.

The rate of return requirement of the loan is that the net operating income of EAP&L and the two bulk supply companies should be not less than 9.5% of average net fixed assets in service in 1972 through 1974 and 8% thereafter. This requirement was fully met in 1972 and 1974, and is expected to be met in 1975. In 1973, the rate of return was 9.2%, somewhat lower than the required 9.5%.

26. Supervision

Contact with EAP&L and the Project will be maintained through the semi-annual visits to supervise the Second Power Project (Gitaru), construction of which commenced during the latter half of 1975.

27. Auditors

EAP&L accounting records are well-maintained and financial reports are prepared promptly. Its accounts are audited annually by the accounting firm of Gill & Johnson of Nairobi, Kenya.

28. Useful Lessons Arising from the Project

This has been a straightforward project with no serious problems arising during construction and during subsequent operation. The delays are no more than normally experienced in a construction program of this nature and completion within five months of the scheduled date in a 4-year development program is not unreasonable. The reasons for the cost overrun are quite explicable and the main useful lessons arising from this project are that (i) even with a well designed and supervised project such as this delays in completion may emerge and (ii) cost estimates for large civil contracts should always include provision for an extension in the construction period of at least six months.

KENYA

KAMBURU HYDROELECTRIC PROJECTOriginal and Final Cost Estimates
(US\$ Thousands)

<u>Description</u>	<u>Original Estimates</u>			<u>Final Estimates</u>		
	<u>Local</u>	<u>Foreign</u>	<u>Total</u>	<u>Local</u>	<u>Foreign</u>	<u>Total</u>
Civil Engineering & Preliminary Works	6,888	12,180	19,068	9,187	16,324	25,511
Electrical Mechanical Plant	672	3,864	4,536	1,590	4,878	6,468
Transmission & Substations	644	2,660	3,304	983	2,920	3,903
Contingencies						
(i) Physical	1,092	2,402	3,494	-	-	-
(ii) Price	1,414	3,346	4,760	-	-	-
Engineering and Supervision	672	1,635	2,307	1,554	3,321	4,875
Total Cost of Project	<u>11,382</u>	<u>26,087</u>	<u>37,469</u>	<u>13,314</u>	<u>27,443</u>	<u>40,757</u>

KENYAKAMBURU HYDROELECTRIC PROJECTAllocation of Proceeds of Swedish Credit & Bank Loan

<u>Category</u>	<u>Allocation Expressed in Equivalent US\$ 000's</u>			
	<u>Original</u>		<u>Final</u>	
	<u>Bank Loan</u>	<u>Swedish Credit</u>	<u>Bank Loan</u>	<u>Swedish Credit</u>
i. Civil Works	9,380	2,800	13,029	3,600
ii. Mechanical & Electrical	2,975	890	3,368	1,000
iii. Transmission Lines & Substations	2,050	610	2,041	600
iv. Engineering, Supervision & other Consulting Services	1,260	380	2,368	700
v. Interest & Other Charges accrued on or before June 30, 1974	2,910	-	2,194	500
vi. Unallocated	4,425	1,320	-	-
	<u>23,000</u>	<u>6,000</u>	<u>23,000</u>	<u>6,400</u>

Note: 1. The allocation of proceeds of the Swedish Credit (31.5mKroner) and the Bank Loan was on the basis of parity at the time of the Joint Financing Agreement. The final disbursement from the Swedish Credit, expressed in US Dollars is greater than estimated at that time because of the subsequent devaluation of the US Dollar.

KENYA

KAMBURU PROJECT

Actual Annual Sales of kWh and Maximum Demand compared with estimates made at the time of the Appraisal

<u>Year</u>	<u>Domestic</u>		<u>Commercial</u>		<u>Industrial</u>		<u>Public Lighting</u>		<u>Off-Peak</u>		<u>Others</u>		<u>Total</u>		<u>Maximum Demand</u> <u>MW</u>
	<u>Units</u> <u>GWh</u>	<u>Growth</u> <u>%</u>	<u>Units</u> <u>GWh</u>	<u>Growth</u> <u>%</u>	<u>Units</u> <u>GWh</u>	<u>Growth</u> <u>%</u>	<u>Units</u> <u>GWh</u>	<u>Growth</u> <u>%</u>	<u>Units</u> <u>GWh</u>	<u>Growth</u> <u>%</u>	<u>Units</u> <u>GWh</u>	<u>Growth</u> <u>%</u>	<u>Units</u> <u>GWh</u>	<u>Growth</u> <u>%</u>	
1971	108.2	2.2	176.1	3.1	274.0	7.8	9.3	7.8	97.9	1.7	11.5	6.3	677	4.8	131
1972	113.1	4.7	193.8	10.1	303.0	10.5	9.8	5.4	105.7	8.0	12.6	10.3	738	9.0	143
1973	118.4	4.7	212.2	9.5	335.0	10.5	10.4	5.5	114.1	8.1	13.9	10.5	804	9.0	156
1974	124.2	4.9	232.4	9.5	369.5	10.4	11.0	5.6	123.4	8.1	15.5	10.8	876	9.0	170
<u>Actual</u>															
1971	112.1	6.7	186.2	9.0	290.4	14.2	9.2	6.1	105.5	9.6	11.9	-23.2 ^{1/}	715.2	10.8	131
1972	120.5	7.5	204.3	9.7	330.3	13.7	9.4	2.2	108.0	11.9	12.4	4.2	794.8	11.1	146
1973	126.7	5.2	223.9	9.6	364.1	10.2	10.4	10.6	121.3	2.8	13.2	6.5	859.7	8.2	161
1974	136.5	7.7	239.5	6.9	403.2	10.7	10.1	-3.0	120.7	-0.5	15.0	10.6	925.0	7.6	171

^{1/} There were some category changes in 1971.

KENYA

TANA RIVER DEVELOPMENT COMPANY LIMITED

COMPARATIVE BALANCE SHEETS

1970-1975
(KSh Thousands)

	1970		1971		1972		1973		1974		1975	
	Estimated	Actual	Estimated	Actual	Estimated	Actual	Estimated	Actual	Estimated	Actual	Estimated	Revised Estimate
Fixed Assets												
Fixed Assets in Service	5,639	5,647	5,889	5,674	5,889	5,694	5,889	5,975	21,140	20,939	21,140	22,828
Less Accumulated Provision for Depreciation	236	236	354	354	473	472	591	591	709	738	1,170	1,176
Net Fixed Assets in Service	5,403	5,411	5,535	5,320	5,416	5,222	5,298	5,384	20,431	20,201	19,970	21,652
Work in Progress	243	259	2,014	1,850	8,064	5,662	13,519	11,675	360	1,012	2,785	9,459
Reserve and Equalization Fund Investments	50	51	75	78	100	106	125	134	150	163	175	188
Net Current Assets	(86)	(219)	75	(648)	100	(410)	125	(261)	150	(937)	175	300
Equity Capital	5,610	5,602	7,524	5,600	13,580	10,580	18,942	16,932	21,036	20,419	22,920	31,599
Share Capital												
Gain on Foreign Exchange	579	579	379	266	579	645	579	794	579	645	579	1,764
Reserve and Equalization Fund	50	51	75	78	100	106	125	134	150	163	175	188
Retained Earnings, Representing:												
Precedents from Insurance Claim				48		48		48		48		48
Excess of Debt Redemption over Depreciation	94	94	222	230	366	370	521	529	688	665	808	1,075
Development Surcharge			155	393	368	840	610	1,320	960	1,695	1,200	1,739
Total Equity Capital	723	772	1,031	1,015	1,413	2,009	1,835	2,885	2,377	3,216	2,762	5,459
Loan Capital												
CDC 'A' Stock	3,210	3,210	3,117	3,372	3,016	2,951	2,907	2,716	2,789	2,730	2,661	2,604
EAPAL 'B' and 'C' Stock	764	764	892	741	961	718	928	960	892	922	880	853
William and Glyn 'D' Stock	736	736	825	677	494	484	363	340	232	228	101	98
Kamuru: IBRD 745 KE			1,073	625	4,244	2,538	7,138	5,742	8,214	7,551	8,047	8,046
SIDA			313	1,241	1,241	741	2,094	1,651	2,400	2,199	2,351	2,352
EAPAL 'E' Stock	157		573	795	2,211	1,119	3,657	2,700	3,822	2,773	3,755	2,955
Government of Kenya										800		986
Foreign Loans												4,779
EAPAL												700
Other												2,740
Total Loan Capital	4,887	4,730	6,593	5,585	12,167	8,571	17,107	14,107	18,559	17,203	20,166	26,140
	5,610	5,502	7,624	6,600	13,580	10,580	18,942	16,932	21,036	20,419	22,920	31,599

14

KEPSA
LAMA RIVER DEVELOPMENT COMPANY LIMITED
COMPARATIVE FUNDS STATEMENT
 1970-1975
 (Ks. Thousands)

	1970		1971		1972		1973		1974		1975		TOTAL	
	Estimated	Actual	Estimated	Actual	Estimated	Actual	Estimated	Actual	Estimated	Actual	Estimated	Actual	Estimated	Actual and Revised Estimate
Source of Funds														
Internal Generation of Funds	414	483	677	631	755	1,342	779	1,154	1,436	1,209	1,811	1,906	5,872	6,705
Interest on Loans before Interest	118	118	118	118	118	118	118	118	118	147	461	438	1,092	1,058
Add Back Non-Cash Charges:														
Depreciation						(379)		(169)		149				(66)
Loss (Gain) on Foreign Exchange						1,081		1,124		1,505		2,344		7,697
Equity Subscriptions	587	581	795	1,062	878	1,081	897	1,124	1,354	1,505	2,272	1,764	6,924	1,764
Borrowings														
The Government of Kenya			250					288	800	800		206	250	1,008
Loans for Kindaruma - EAPFL			1,073		3,171	2,558	2,914	3,184	1,056	1,809		663	8,214	8,214
Loans for Kamburu I			313		928	741	853	910	306	548		201	2,400	2,400
SIDA														
EAPFL	157		316		1,738	324	1,446	1,581	165	73		234	3,822	3,007
Loans for Kamburu II									310		1,220		1,530	
Loans for Gitaru												870		8,479
Total Borrowings	157		1,952	795	5,837	3,623	5,213	5,963	1,837	3,230	2,090	8,472	17,086	23,966
Total Funds Provided	689	581	2,747	3,857	6,711	4,704	6,110	7,087	3,391	4,235	4,362	13,692	24,010	32,837
Application of Funds														
Construction Expenditure (Including interest charges on construction):														
Kindaruma	23	31	250	76		20		281		1		819	273	359
Kamburu I	123	139	1,771	1,591	6,050	3,812	5,455	6,013	1,732	3,397	1,490	961	15,111	13,711
Kamburu II									360				1,850	961
Gitaru														
Total	146	170	2,021	1,617	6,050	3,832	5,455	6,294	2,092	4,301	2,443	10,336	18,189	26,530
Debt Service														
Interest on Loans	376	376	369	388	373	348	357	338	894	818	1,426	1,427	3,795	3,695
Repayment of Loans	131	131	246	254	263	258	273	278	285	283	581	848	1,278	2,052
Total Debt Service	507	507	615	642	636	606	630	616	1,179	1,101	2,007	2,275	5,073	5,747
Increase in Reserve and Equalization Fund	25	26	25	27	25	28	25	28	25	29	25	25	150	163
Increase (Decrease) in Net Current Assets	11	(122)	86	(628)		238		169		(696)		(85)	97	397
Total Funds Applied	683	581	2,747	3,857	6,711	4,704	6,110	7,087	3,391	4,235	4,362	13,692	24,010	32,837

ANNEX 5

KENYA

TANA RIVER DEVELOPMENT COMPANY LIMITED

COMPARATIVE INCOME STATEMENT

1970-1975
(Ks. Thousands)

	1970		1971		1972		1973		1974		1975	
	Estimated	Actual	Estimated	Actual	Estimated	Actual	Estimated	Actual	Estimated	Actual	Estimated	Revised Estimate
Revenue for Sale of Electricity	596	601	863	1,125	946	1,143	974	1,196	1,700	1,597	2,487	2,509
Operating Expenses												
Operations and Administration	64	69	68	65	72	65	77	75	146	96	215	185
Depreciation	118	118	118	118	119	118	118	119	118	147	461	438
Total Operating Expenses	182	187	186	183	191	183	195	194	264	243	676	603
Net Operating Income	414	414	677	942	755	960	779	1,002	1,436	1,354	1,811	1,906
Other Income (Expenses)												
Gain (Loss) on Foreign Exchange				(313)		379		149		(149)		
Investment and Other Income		49		2		3		3		4		
Total Other Income (Expenses)		49		311		382		152		(145)		
Net Income Before Interest	414	463	677	631	755	1,342	779	1,154	1,436	1,209	1,811	1,906
Interest on Loans	376	376	369	388	373	348	357	338	894	818	1,426	1,421
Net Income for the Year	38	87	308	243	382	994	422	816	542	391	385	479

ANNEX 5

KENYA

THE KENYA POWER COMPANY LIMITED

IANA RIVER DEVELOPMENT COMPANY LIMITED

THE EAST AFRICAN POWER AND LIGHTING COMPANY, LIMITED

COMPARATIVE COMBINED BALANCE SHEETS

1970-1975
(K£ Thousands)

	1970		1971		1972		1973		1974		1975	
	Estimated	Actual	Estimated	Actual	Estimated	Actual	Estimated	Actual	Estimated	Actual	Estimated	Revised Estimate
Fixed Assets												
Fixed Assets in Service	36,060	34,250	39,646	38,200	40,801	39,050	42,723	41,117	59,174	57,360	60,474	63,359
Provision for Depreciation	12,242	12,187	13,079	13,128	14,852	14,298	16,269	15,457	17,762	16,625	19,642	18,311
Net Fixed Assets in Service	23,818	22,063	26,567	25,072	25,949	24,752	26,454	25,660	41,412	40,735	40,832	45,048
Work in Progress	1,535	2,135	2,524	2,217	9,069	6,553	13,924	12,892	765	4,228	3,625	13,113
Investments	1,251	1,266	1,081	1,108	925	966	781	832	649	710	525	589
Net Current Assets	2,550	2,140	2,391	2,388	825	2,654	170	501	1,124	1,262	1,615	323
	29,154	27,604	32,163	30,785	36,768	34,935	41,329	39,885	43,950	46,935	46,597	59,073
Equity Capital												
TRDC	723	772	1,031	1,015	1,413	2,009	1,835	2,825	2,377	3,216	2,762	5,459
KPC	1,440	1,499	1,506	1,310	1,585	1,745	1,678	1,993	1,785	1,990	1,913	2,133
EAP&L	14,760	14,653	15,607	14,798	16,434	15,701	17,516	16,126	18,644	17,005	19,633	17,945
Total Equity Capital	16,923	16,924	18,144	17,123	19,432	19,455	21,029	20,944	22,806	22,211	24,308	25,537
Provision for Deferred Taxes				500		1,000		1,650		1,650		2,136
Loan Capital												
TRDC: IBRD 745 KE												
SIDA	1,073		1,073		4,244	2,558	7,158	5,742	8,214	7,551	8,047	8,046
Other	313		313		1,241	741	2,094	1,651	2,400	2,199	2,351	2,352
KPC	3,966	3,966	3,742	4,049	3,510	3,435	3,270	3,054	3,331	3,758	4,967	11,207
EAP&L	3,837	3,585	3,771	3,350	3,600	3,167	3,087	2,678	2,810	2,667	2,517	2,347
Total Loan Capital	4,628	3,129	5,291	5,342	4,991	4,579	4,691	4,166	4,389	5,899	4,407	7,428
	12,231	10,680	14,019	13,162	17,336	14,480	20,300	17,291	21,144	23,074	22,289	31,180
	29,154	27,604	32,163	30,785	36,768	34,935	41,329	39,885	43,550	46,935	46,597	59,073
Debt/Equity Ratio	42/58	39/61	44/56	43/57	47/53	43/57	49/51	45/55	48/52	51/49	48/52	55/45

KENYA

THE KENYA POWER COMPANY LIMITED

TANA RIVER DEVELOPMENT COMPANY LIMITED

THE EAST AFRICAN POWER AND LIGHTING COMPANY, LIMITED

Comparative Combined Income Statement

1970 - 1975
(K£ Thousands)

	1970		1971		1972		1973		1974		1975	
	Estimated	Actual	Estimated	Actual	Estimated	Actual	Estimated	Actual	Estimated	Actual	Estimated	Revised Estimate
Revenue from Sale of Electricity	7,212	7,477	7,796	8,243	8,424	9,122	9,097	9,876	9,824	11,869	10,615	13,380
Operating Expenses												
Operations and Administration	2,615	2,857	2,836	3,194	3,031	3,457	3,332	3,962	3,370	5,690	3,670	6,256
Power Purchased from Uganda	418	466	418	570	398	525	398	599	398	573	398	398
Depreciation	1,046	1,209	1,237	1,107	1,373	1,370	1,417	1,372	1,493	1,347	1,260	1,686
Income Taxes	1,106	1,112	1,083	1,255	1,053	1,319	1,212	1,700	1,252	200	1,200	1,463
Total Operating Expenses	5,185	5,644	5,574	6,126	5,855	6,671	6,359	7,633	6,514	8,510	7,148	9,809
Net Operating Income	2,027	1,833	2,222	2,117	2,569	2,451	2,738	2,243	3,310	3,359	3,467	3,571
Other Income (Expenses)	271	447	327	(469)	384	1,586	479	869	424	(110)	321	370
Net Income Before Interest	2,298	2,280	2,549	1,648	2,953	4,037	3,217	3,112	3,734	3,249	3,788	3,941
Interest on Loans	548	529	548	669	885	849	840	767	1,177	1,128	1,506	1,523
Net Income	1,750	1,751	2,001	979	2,068	3,188	2,377	2,345	2,557	2,121	2,282	2,418
Net Operating Income as % of Average Net Fixed Assets in Service $\frac{1}{2}$	9.3%	8.7%	9.2%	9.7%	10.2%	10.2%	10.8%	9.2%	10.0%	10.4%	8.6%	8.5%
Sales - GWh	621	646	677	715	733	795	804	860	876	925	955	1,005
Sales Revenue in Kenya Cents per GWh	23.23	23.15	23.03	23.06	22.38	22.95	22.63	22.97	22.43	25.66	22.23	26.63

$\frac{1}{2}$ Net operating income used for calculating rate of return is the net operating income shown in this statement less interest earned credited to operating expenses and a notional tax on NPC profits, plus rental income included in other income.

January 23, 1976

KENYA

THE NENTA POWER COMPANY LIMITED

TANA RIVER DEVELOPMENT COMPANY LIMITED

THE EAST AFRICAN POWER AND LIGHTING COMPANY, LIMITED

Comparative Combined Funds Statement

1970 - 1975
(K£ Thousands)

	1970		1971		1972		1973		1974		1975		Total	
	Estimated	Actual	Estimated	Actual	Estimated	Actual	Estimated	Actual	Estimated	Actual	Estimated	Actual	Estimated	Actual and Revised Estimate
Source of Funds														
Internal Generation of Funds														
Net Income Before Interest	2,298	2,280	2,549	1,648	2,953	4,037	3,112	3,112	3,734	3,249	3,788	3,941	18,539	18,267
Add (Deduct) Non Cash Charges														
(Credits):														
Depreciation	1,046	1,195	1,237	1,093	1,373	1,355	1,417	1,359	1,493	1,332	1,880	1,686	8,446	8,020
Loss (Gain) on Sale of Assets & Investments	(99)	(99)	(26)	(26)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(127)
Loss (Gain) on Foreign Exchange	3,344	3,376	3,786	4,087	4,326	4,757	4,634	4,681	5,227	5,054	5,668	6,333	26,985	28,288
Repayment of Tanzania Bills of Exchange	231	232	218	219	204	205	192	192	180	180	172	169	1,197	1,197
Equity Borrowings														
TRDC: IBRD 745 KE			1,073	2,558	3,171	2,558	2,914	3,184	1,056	1,809	663	663	8,214	8,214
TRDC: SIDA			313	741	928	741	853	910	306	548	201	201	2,400	2,400
Other			1,031	1,959	3,299	3,299	3,767	4,171	1,672	800	1,895	7,987	2,205	8,787
EAPEL			3,016	1,786	4,099	3,299	3,767	4,171	1,672	2,828	385	716	4,432	7,366
Total Borrowings	3,016	1,786	2,417	1,959	4,099	3,299	3,767	4,171	1,672	5,985	2,280	9,567	17,251	26,767
Disposal of Assets	135	138	66	66	113	58	113	113	7,079	1,357	8,120	17,833	135	534
Total Funds Provided	6,726	5,532	6,421	6,331	8,629	8,319	9,157	9,157	7,079	11,378	8,120	17,833	45,568	58,550
Application of Funds														
Capital Expenditure														
TRDC: Kamburn I	123	139	1,771	1,591	6,050	3,812	5,455	6,013	1,732	3,397	2,425	819	15,131	15,771
Other	23	31	250	26	281	20	281	281	360	904	2,425	9,517	3,058	10,779
KFC														71
EAPEL	3,620	2,538	2,534	2,613	1,650	1,582	1,322	2,395	1,200	3,582	1,735	4,548	12,081	17,259
Total Capital Expenditure	3,766	2,708	4,575	4,236	7,700	5,439	6,777	8,709	3,292	7,903	4,160	14,884	30,270	43,879
Debt Service														
Interest on Loans	548	529	548	669	885	849	840	767	1,177	1,128	1,506	1,523	5,504	5,465
Repayment of Loans	165	442	629	337	782	846	803	920	828	672	1,135	1,461	4,342	4,678
Dividends - EAPEL	713	971	1,177	1,006	1,667	1,695	1,643	1,687	2,005	1,800	2,641	2,984	9,846	10,143
Increase in Reserve and Equalization Fund	780	780	780	780	780	856	780	856	790	856	780	856	4,680	4,984
Increase (Decrease) in Net Current Assets	48	64	48	61	48	63	58	58	48	58	48	48	225	352
Total Funds Applied	1,009	1,009	(159)	248	(1,566)	266	(655)	(2,153)	954	761	491	(939)	684	(809)
Times Debt Service Covered by Internal Generation of Funds	6,726	5,532	6,421	6,331	9,629	9,319	9,593	9,157	7,079	11,378	9,120	17,833	45,568	58,550
	4.7	3.5	3.2	4.1	2.6	2.8	2.8	2.8	2.6	2.8	2.1	2.1	2.7	2.8

January 23, 1976

