

**AF58**  
Volume 9

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INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT  
INTERNATIONAL DEVELOPMENT ASSOCIATION

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PROSPECTS FOR ECONOMIC DEVELOPMENT IN EAST AFRICA

(in four volumes)

VOLUME II - KENYA

(in seven parts)

PART SIX: ANNEX E - ELECTRIC POWER

August 31, 1967

Africa Department

## EQUIVALENTS

### Currency

1 Kenya Shilling	U. S. \$0.14
U. S. \$1	K. Sh 7.14
£ 1	U. S. \$2.80
£ 1	K. Sh 20.00

### Weight

Throughout this report, unless otherwise stated, tons refers to long tons of 2240 lbs.

## COMPOSITION OF THE MISSION

This report is based on the findings of a Mission to East Africa which did its field work in October, November and December 1966 and consisted of the following:

John C. de Wilde, Chief of Mission (IBRD)

Colin M. F. Bruce, Deputy Chief of Mission  
and Chief Economist - Kenya (IBRD)  
Kudlapur G. V. Krishna, Economist - Kenya (IBRD)  
C. G. Akhurst, Agricultural Adviser - Kenya (FAO)  
Maurice Fenn, Agricultural Economist - Kenya (FAO)

Per Tveite, Deputy Chief of Mission  
and Chief Economist - Tanzania (Consultant)  
Bruno E. Scheltema, Economist - Tanzania (IBRD)  
Archie Forbes, Agricultural Adviser - Tanzania (FAO)  
Jacques Kahane, Agricultural Economist - Tanzania (IBRD)

Otto Maiss, Deputy Chief of Mission  
and Chief Economist - Uganda (IBRD)  
Nicholas Carter, Economist - Uganda (IBRD)  
David W. M. Haynes, Agricultural Adviser - Uganda (IBRD)  
Montague Yudelman, Agricultural Economist - Uganda (Consultant)

H. David Davis, Adviser on Tourism (IBRD)  
Bernard H. Decaux, Adviser on Industry (Consultant)  
Jack Derrick, Adviser on Industry (Consultant)  
Edward V. K. Jaycox, Adviser on Transport (IBRD)  
Aristides J. Macris, Adviser on Agricultural Training  
and Education (IBRD)  
David McLellan, Adviser on General Education (Consultant)  
Lyell H. Ritchie, Adviser on Industrial Finance (IFC)  
Gavin Wyatt, Adviser on Power (IBRD)

The Mission's findings relate for the most part to the situation as of the end of 1966, although in some respects note has been taken of developments up to the middle of 1967.

## ELECTRIC POWER IN KENYA

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## ELECTRIC POWER IN KENYA

### SUMMARY AND CONCLUSIONS

1. Sales of energy which in recent years have been relatively stagnant showed signs of resuming their former upward trend in 1966. This trend is expected to continue and an average annual increment of about 9½ percent is forecast during the period 1967-75.
2. The demand for energy in the past has been met by developments of small run-of-river hydro projects combined with diesel stations and bulk supply from Uganda in the Nairobi and West Kenya area, and by an oil-fired steam station at the coast.
3. Additional sources of energy will be needed in the coastal and Nairobi and West Kenya areas by about 1970 or 1971. Present tentative plans (still in the formative stage) provide for an extension of the Mombasa steam station at Kipevu and construction of a transmission line from Mombasa to Nairobi by about the end of 1970. These plans assume that Kenya will continue to import a bulk supply of 30 MW from Uganda.
4. In view of Uganda's present and future interest in some form of cooperation with Kenya in the development of major generating resources and the probable savings in capital expenditure and reduction in costs of power to both countries, an immediate attempt should be made to reach agreement with Uganda on a detailed joint investigation of a possible program of cooperation and the benefits which would thereby accrue to both countries. If a decision to cooperate in principle cannot be reached before early 1968, both countries will be obliged to commence their own major projects to avoid a power shortage in the early 1970's and the opportunity for joint development of a major project may not arise again for many years.
5. The program for development of sub-economic projects in outlying areas should be carefully devised to take account of the capacity of the distributing company to absorb the annual losses without undue detriment to existing consumers' interests and of the company's ability to borrow money in world markets.
6. The East African Power & Lighting Company Ltd. should be encouraged by such means as are available to the Government to provide as much finance from internally generated funds as possible, having due regard to what the business will stand.
7. There is a need to improve cooperation between irrigation and power interests in development of the Tana River.
8. While the EAP&L is vigorously pursuing a program to train Kenya citizens to occupy posts at all levels in the company it is handicapped by the fact that relatively few students in the secondary schools receive the technical training essential for careers in the power industry.

## ELECTRIC POWER IN KENYA

### Introduction

1. The public supply of electric power in Kenya has always been provided by private enterprise. In 1907, a company was formed to provide supplies for Nairobi and, in 1909, another company was formed to supply Mombasa. Demand grew rapidly and by the end of the first World War both companies were having difficulty in raising the capital required for development.
2. Reconstruction of the companies took place in 1922 with the assistance of Power Securities Corporation Limited of London. The two original companies were combined into the East African Power & Lighting Company Ltd. (EAP&L) which today is the only public supplier of electrical power in Kenya. Since the EAP&L was formed in 1922, the Government has from time to time granted the Company licenses to extend its supplies into new areas. Nakuru and Eldoret were first supplied in 1931 and 1933 respectively and, since then, licenses have been obtained and supplies initiated to Kisumu, Kitale, Nanyuki, Gilgil, Thomsons Falls and other important centers of population. Supplies to Nyeri were first provided by the Government of Kenya but the undertaking was subsequently taken over in 1960 by the EAP&L in exchange for 150,000 £1 shares in the Company issued at par and a payment of £50,000 in cash.
3. In 1954, the Uganda Electricity Board (UEB), which had taken over the EAP&L Company's assets in Uganda in 1948 and built the Owen Falls Power Station on the Nile, approached EAP&L with an offer of a bulk supply at Tororo on the Uganda/Kenya border. At that time, the EAP&L was faced with the alternative of extending its diesel generating plant in the Nairobi area or embarking on a major hydroelectric development at Seven Forks on the Tana River. Although the proposed cost of Uganda power delivered to Nairobi was not comparable with the cost of locally generated hydroelectric power in the Nairobi area (see paragraph 36) from the Company's existing stations, it was less than the cost of diesel power and had an attraction to the EAP&L in that it enabled the Company to defer the raising of large amounts of capital for the Seven Forks project.
4. Negotiations for a bulk supply of 45 MW from Uganda were completed at the end of 1955, and the Kenya Power Company Limited (KPC) was formed to build the necessary transmission facilities from Tororo to Nairobi. The KPC also purchased the Wanji and Tana hydroelectric generating stations of the EAP&L in the Nairobi/Fort Hall area together with the principal transmission lines from these stations to Nairobi. In 1965, the EAP&L decided to proceed with the first stage of the Seven Forks project and for this purpose formed the Tana River Development Company Limited (TRDC).
5. The companies comprising the electrical supply industry in Kenya today are therefore as follows: the EAP&L which distributes and sells power to consumers at branches throughout the country; the KPC which purchases a bulk supply from Uganda and generates some hydroelectric power in Kenya and sells the whole of its energy to the EAP&L in bulk at ascertained cost; and the TRDC which is now constructing at Kindaruma the first stage of the Seven Forks project, the output of which will be sold in bulk to the EAP&L at ascertained cost. The KPC is managed and staffed by the EAP&L and it is expected that similar arrangements will apply to the TRDC as soon as it commences to supply power.

## Demand for Electricity

6. The growth of maximum demand from 1950 to 1965 is shown in Table 1. The increase in the total from 20.6 MW in 1950 to 83.6 MW in 1965 represents an average annual growth rate of 9.8 percent over the 15-year period. Although growth in the Nairobi and West Kenya area averaged only 9.3 percent over the whole period, it averaged well over 20 percent annually between 1950 and 1954. Since 1954, the annual growth has been at a much lower rate and very erratic. Some of the fluctuations in growth rate have been caused by control of the maximum demand through the introduction of rhythmic control of the water heating load in the Nairobi and Mombasa areas in the 1950's, but principally they have been caused by political factors, starting with the Mau Mau rebellion at the end of 1952.

7. The growth of maximum demand at the Coast has been much less erratic than up country, mainly because of the addition of large industrial loads such as cement and oil refining in recent years. Growth over the period has been at an average annual rate of about 12 percent and has been markedly higher than Nairobi and West Kenya in the last four years. The maximum demand in Kitale has remained relatively static since 1959 due to the repercussions of political events on the European farming community, on whom the electrical development of the area has until very recently depended. In Nanyuki, the maximum demand has fallen since 1961, due almost entirely to the withdrawal of British troops, who had previously provided most of the demand in this area. In other respects the Nanyuki situation is similar to that of Kitale.

8. The growth of sales from 1950 to 1965 is shown in Table 2. The average annual growth rate of about  $12\frac{1}{4}$  percent over the 15-year period is higher than the rate of growth in demand referred to in paragraph 6 above. This is principally due to the improvement in load factor obtained from introduction of rhythmic control of the off-peak water heating tariff, referred to in paragraph 6 above.

9. Growth of sales in the coastal area has averaged about  $15\frac{1}{4}$  percent a year over the last 15 years, compared with about  $11\frac{1}{2}$  percent a year in Nairobi and West Kenya. Almost all of this growth has been due to an increase in industrial sales of about 19 percent a year, as compared with about  $11\frac{1}{2}$  percent in Nairobi and West Kenya. Mombasa as the only seaport in Kenya has attracted the larger industries such as cement and oil refining, which are dependent on imports or exports, whereas Nairobi has attracted a greater proportion of smaller secondary industries, because it is the center of a large local market. Industrial sales accounted for 69 percent of the total sales at the coast compared with only 36 percent in Nairobi and West Kenya.

10. Residential sales (including off-peak water heating) which represent 45 percent of total sales in Nairobi and West Kenya and only 16 percent of the total at the coast, increased at average annual rates of about  $11\text{-}3/4$  percent and  $10\frac{1}{2}$  percent respectively. There was a drop in sales on these tariffs amounting to  $2\frac{1}{2}$  percent in Nairobi in 1965 and 4 percent at the coast over the two years, 1964 and 1965. Sales on the commercial tariff (after making allowance for transfers between tariffs) have increased at an average annual rate of about  $10\frac{1}{2}$  percent over the 15-year period, both at the coast and up country.

11. From the above, it will be seen that over the past 15 years the demand for power has shown considerable sensitivity to the political situation, especially in the up-country areas where sales are predominantly to residential consumers. Until very recently, the demand for electricity in Kenya arose almost entirely from the European and Asian communities. It was inevitable therefore that the readjustments necessitated by the changes in the political situation in recent years would have their effect on the demand. However, these changes should be of a transient nature and the underlying strength of the industrial and commercial demand seems to indicate that, once this period of adjustment is ended, sales should resume their upward trend. The indications from the first ten months of 1966 are that the transition period may now be ending and the increase in sales for the year may be the highest since 1960. This is particularly noticeable in the Nairobi and West Kenya areas where most of these increased sales have taken place.

Existing Installations

12. The attached map shows the location of the generating stations and the main transmission lines. Except for the minor undertakings of Kitale, Nanyuki and Meru, all the up-country branches are supplied from a central grid, the backbone of which is formed by the 132-kv bulk supply lines from Uganda. Of the power consumed by this system, 95 percent is supplied by the KPC from its bulk supply imports and from generation at Wanji and Tana hydroelectric stations in Kenya.

13. The capacity of installed generating plant at the different generating stations is shown in Table 3. Total power facilities available are:

Hydroelectric plant in Kenya	27,900 kw
Thermal plant in Kenya	83,742 kw
Bulk supply from Uganda	<u>30,000 kw</u>
<u>Total</u>	<u>141,642 kw</u>

Of the total of 141.6 MW approximately 120 MW may be regarded as firm, having regard to the size of units, the age of plant and the dry season flow of the rivers.

14. All the hydroelectric generating stations in Kenya (EAP&L and KPC) are run-of-river with only limited daily pondage and are situated in the Nairobi and West Kenya area. The two KPC stations are some miles apart in the Tana River Basin and the water discharged from the upstream station (Wanji) is used in the downstream station (Tana) about five hours later. Since both these stations have limited daily pondage only, and in the dry season river flows vary considerably from day to day, the programming of their operation in conjunction with the thermal stations is a very complex matter if maximum usage of water and maximum efficiency of thermal plant operation is to be achieved. Considerable skill has been acquired by the staff over many years' operation and although the river flows fall to about 50 percent or less of the installed plant capacities at hydro stations, the peaking capability of the system at these times is only slightly reduced.

15. The largest unit on the Nairobi and West Kenya system is only 4 MW,

which is not sufficient standby for the total system capability of 92.3 MW. Firm capability has therefore been assumed to be the total capability less the gas turbines and temporary station at Nairobi South. Neither of these items is suitable for continuous running -- the gas turbines because of their very high fuel consumption and the temporary station diesels because of their age.

16. Most of the 60 diesel generating units, which vary in size from 50 kw to 2,200 kw, have been in service for a long time, in some cases about 20 years. However, apart from the temporary station, most of the units in the Nairobi area have been used mainly for peaking purposes and for firming up the hydro generating plant since the mid-1950's. Provided they are limited to this duty, they could continue to serve a useful purpose for a good many years to come.

17. The gas turbine plant at Nairobi South consists of two 2.5 MW open cycle units, derated to 2.2 MW for ambient air temperature. These units were installed in the early 1950's and are two of the first (if not the very first) commercial gas turbines installed by a public utility. They are designed to run on heavy fuel of 1,500<sup>o</sup> Redwood viscosity. They suffer from the disadvantages that they require a warming-up period of about ten hours, they have a high fuel consumption, and the output is very sensitive to ambient air temperatures. On the other hand, their control is largely automated and they are very reliable in operation.

18. The Kipevu steam station at Mombasa contains three machines of 5 MW each and two of 12.5 MW. The station was commissioned in 1957 with two 5 MW machines. The last machine of 12.5 MW was installed in 1966. The station uses Bunker 'C' fuel.

19. The long rail haul of 300 miles from the coast to Nairobi adds about 35 percent to the cost of industrial diesel fuel and about 70 percent to the cost of Bunker 'C' fuel. Thermal generation in the Nairobi and up-country areas is therefore relatively costly. In the case of diesel generation, costs are further increased by the derating of plant due to altitude. To quote an example, a diesel engine of 1,000 H.P. rating at sea level will only produce about 720 kw at Eldoret (7,000 feet altitude), thus increasing the capital costs of a diesel station in Eldoret by approximately 40 percent. The Nairobi and West Kenya developed areas, which account for 74 percent of electricity sales, range from about 4,000 feet to 9,000 feet altitude, the main centers of Nairobi and Nakuru being at 6,000 feet.

20. The transmission system of Nairobi and West Kenya is based on the KPC's 250-mile long double circuit 132-kv bulk supply line from Tororo (five miles beyond the Uganda border) to Juja Road Substation in Nairobi. This line, which crosses the Mau mountain range at 9,000 feet altitude, has intermediate 132/33-kv step-down substations containing sectionalizing switches at Lessos, for the supply to Eldoret, Kisumu and Kericho, and at Lanet, for the supply to Nakuru, Naivasha and Thomsons Falls. Although the line passes through an area of high isoceraunic intensity and special precautions had to be taken to reduce corona discharge at high altitudes, it has proved remarkably reliable in service. It operates at a transmission efficiency, including step-down transformer losses, of about 92 percent. The line has proved stable when operating with an input

of 45 MW at Tororo.

21. With the exception of two 66-kv lines from the Tana Power Station to Juja Road Substation in Nairobi, all other transmission of importance in Kenya is at 33 kv.

#### The Companies' Licenses

22. The public supply of electricity is governed by the Electric Power Ordinance (1920), now known as the Electric Power Act, under which separate licenses are issued for the generation and distribution of electricity. The EAP&L is the only licensed distributor in Kenya at the present time, but its monopoly extends only to those areas defined geographically by the several licenses it has acquired over the years. The EAP&L also holds separate generating licenses for all its generating stations.

23. The KPC operates under Bulk Supply License No. 2 which authorizes the Company to import and transmit power from Uganda, to generate at the Wanji and Tana hydroelectric stations, and to sell in bulk only to licensed distributors. It cannot sell in bulk to another bulk supplier, and it must sell its output at ascertained cost. On expiration of the license, by which time its capital will have been fully redeemed, the assets of the Company become the property of the Kenya Government.

24. The TRDC operates under Bulk Supply License No. 3 issued in 1965 authorizing it to generate power on the Tana River from successive developments in the Seven Forks area, and sell its output in bulk at ascertained cost to licensed distributors. The license contains similar provisions to the KPC license regarding the assets of the Company becoming the property of the Government on expiry of the license.

#### Organization

25. The East African Power and Lighting Company Limited is a Kenya company registered in Kenya. The 9,741,504 £1 shares of the Company are widely distributed throughout the world amongst some 13,000 shareholders. The largest single shareholder is the Kenya Government which acquired £150,000 shares through the sale of its Nyeri undertaking to the Company in 1960.

26. The Directors of the EAP&L are elected at the Annual General Meetings of the Company held in Nairobi. The Board consists of a Chairman and eight members. In 1923 a Local Board, consisting of not less than three nor more than five members, was created in London by the Nairobi Board for the purpose of managing the affairs of the Company in England. Certain powers were delegated to the Local Board principally concerned with the management of the Company's London office and the handling of share transfers, investments and other financial matters. For many years now, the Chairman of Power Securities Corporation Limited (PSC) has been elected as Chairman of the EAP&L Local Board. The PSC was originally responsible for the formation of the EAP&L and up to the present day has acted as financial advisor and underwriter for public share issues of the Company. Other members of the Local Board are prominent individuals connected with the development of the African continent, and representatives of Balfour Beatty & Company Limited

(BB&Co.), a subsidiary of the PSC. The EAP&L has had agreements with BB&Co. since the earliest days, covering such matters as consulting services, purchasing and general contracting. The Company has benefited greatly in the past from the wide experience of the PSC and BB&Co. in the power field in other parts of the world.

27. The Kenya Power Company is also registered in Kenya and has a Board of six members nominated by the three shareholders who are the EAP&L, PSC and Kenya Government. One of the two members nominated by the EAP&L must be the Government-nominated member of the EAP&L Board. The Chairman is selected by the PSC from among the two members nominated by them. The KPC also has a Local Board in the U.K. which generally, though not always, is made up of the same individuals as the EAP&L Local Board.

28. The Tana River Development Company is a private limited company registered in Kenya, with a Board of four members, each nominated by one of the four partners. The partners are the EAP&L, the PSC, the Kenya Government and the Commonwealth Development Corporation (CDC) and the Chairman is nominated by PSC.

29. Of the three companies, only the EAP&L has an operating staff and this Company acts as a Managing Agent for the KPC, and will probably do the same for the TRDC when it commences to generate power. The EAP&L does not charge an agency fee for its services since it is the sole purchaser of energy from the KPC. Charges for materials and services employed on KPC work are at cost. This close relationship between the companies and with the Government has proved very beneficial in avoiding duplication of overheads and in avoiding conflicts of interest. The close liaison with the Government through the Government nominees (who are in some cases officials of the Ministry of Power and Communications) on the Boards of the three companies, has enabled the Company and the Government to understand each other's problems and agree on common policies with regard to power developments.

30. The staff of the EAP&L is composed of persons of African, Asian and European origin. Most of the Asians and some of the Europeans were born in Kenya and are Kenya nationals. The Company, recognizing the need to make the organization independent of expatriate staff, is pursuing a vigorous policy of training Kenya citizens to occupy posts at all levels in the Company. For this purpose, it has, since 1957, operated a training establishment on which £63,000 has been spent in buildings to date. The school is run under the direction of the Company's Personnel Manager, who is an outstanding man in this field. Current expenditure on training is about £100,000 a year and is an indication of the importance the Company attaches to this matter. Great difficulty is experienced, however, in obtaining students with the proper background for training. For example, at the present moment, only two of the 122 African Secondary Schools in Kenya preparing boys for the General Certificate of Education are giving students any form of technical training relevant to the requirements of the engineering industry. This imbalance makes it difficult for technical industries, such as the power supply industry, to break away from their dependence on expatriate skills, and urgent steps should be taken to rectify this situation.

31. The Company is efficiently run, and labor relations are good. A

wage settlement negotiated with the unions by the normal process of collective bargaining early in 1966 gave the nonprofessional employees a 10 percent increase in wages in return for a two-year standstill.

32. Consultants and contractors are employed on all major power station and transmission works. Minor power station extensions and main extensions up to 33-kv are normally carried out by the Company's staff.

33. The accounts department of the Company is highly mechanized and includes a computer which is also used for other purposes, including staff records, engineering problems and analysis of tariff statistics, etc. The Company collects deposits from the consumers which in total amount to about 6½ percent of the current annual revenue. Allowing for these deposits, the net outstanding revenue for unbilled energy supplied, bills being processed and bills awaiting payment is only about 5 percent of annual revenue. Bad debts in recent years have been insignificant.

#### Financial Situation

34. The EAP&L has an authorized capital of £10 million of which £9,741,504 has been issued and paid up. The issued capital includes £1,800,000 4 percent cumulative shares and £350,000 7 percent cumulative preference shares. With the exception of £150,000 of shares issued to the Government of Kenya at par in exchange for its Nyeri undertaking, all the capital has been raised by public share issues. The backing of Power Securities in the London market and the prudent financial policy of the Company has enabled the Company until recently to issue shares at a high premium. As a result, the capital reserves at the end of 1963 contained an item of £1,428,998 in respect of the share premium account. This reserve was capitalized in 1964 by the issue of one new ordinary share for every four ordinary shares held. Capital and revenue reserves and retained profits at the end of 1965 stood at £3,163,793, bringing the total capital employed to £12,905,299. The return on net fixed assets in 1965, after providing for depreciation and debenture stock interest, but before taxation, was 11.9 percent. The return after taxation was 8.8 percent and an ordinary dividend of 8 percent was paid. The dividend of 8 percent represents a return of only 4.7 percent on the capital employed, which is very much less than the cost of borrowing money in world markets today. A brief summary of the Company's financial and statistical record is given in Table 4.

35. The KPC has an authorized share capital of £100 which is owned in equal proportions by the EAP&L, the Kenya Government and PSC. The balance of the Company's finance amounting to £7.5 million has been provided by a single issue of debentures at the time the Company was formed in 1954. Half the sum realized by the debenture issue was used to purchase the EAP&L's stations at Wanji and Tana, together with their 66-kv transmission lines, and the balance was used to build the 132-kv bulk supply lines from Uganda, and the 132-kv step-down substations of Juja Road, Lanet and Lessos. The Company's structure is such that it cannot raise additional capital and its activities are limited strictly to operating the bulk supply, and generating power at its existing hydroelectric stations at Wanji and Tana. A summary of its 1965 balance sheet is given in Table 5.

36. A summary of the KPC revenue account for 1965 is given in Table 6, from the footnote to which it will be noticed that the average cost of power delivered to the EAP&L in that year was 6.9503 cents per kwh, although the average cost of power purchased by KPC from the UEB in Uganda was only 4.39 cents, according to the UEB annual report for 1965.<sup>1/</sup> In fact the cost of Uganda power delivered to the EAP&L in Nairobi is nearly 9 cents per kwh, but nearly half the power sold by KPC to EAP&L is generated at a much lower cost of about 5 cents at its Wanji and Tana stations in Kenya. The breakdown of 1965 costs per kwh sold is given below:

	<u>Generated Supply</u> <u>cents/kwh sold</u>	<u>Bulk Supply</u> <u>cents/kwh sold</u>
Purchased Supply	-	4.80
Generated Supply (Operating Costs)	1.14	-
Transmission (Maintenance)	0.09	0.44
Juja Road Substation (Operation and Maintenance)	0.18	0.17
Capital Charges	3.34	3.18
Management	<u>0.20</u>	<u>0.19</u>
Total	4.95	8.78
Million kwh sold at Juja Road Substation	159	174

Average cost of 333 million kwh at Juja Road Substation = 6.9503 cents.

It will be seen from the above that basically the difference in costs of the two sources of supply is made up of capital charges and maintenance on the 250-mile transmission line from Tororo to Nairobi though the fact that 30 percent of the generating plant for the locally generated supply was installed in the 1930's has contributed to the relatively low capital charges for this supply.

37. The TRDC has an authorized capital of £100 which is owned in equal proportions by the EAP&L, the Kenya Government, the CDC and PSC. The Company was formed in 1964 and is currently building the first 40 MW stage of the Seven Forks project at Kindaruma on the Tana River. Finance for this project estimated to cost £6.7 million has been obtained in the following manner:

- (1) £3,500,000 from the CDC in the form of a 23-year loan repayable over the last 20 years. Interest rate is  $1\frac{1}{4}$  percent above U.K. Treasury rate at the time of withdrawal and toward the end of 1966 had averaged 8.23 percent. Interest during construction will be added to the loan.

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<sup>1/</sup> This report refers to Kenyan cents of which 7.14 equal 1 US cent.

- (2) £1,547,000 from a consortium of London bankers, and secured by export credit guarantees. This sum is repayable over 10 years commencing in December 1967 at a rate, including financial charges but excluding interest, of £184,470 per annum. The interest rate is 5½ percent. The amount of this loan can be increased to an upper limit of £1,844,661.
- (3) £1,639,000 from the EAP&L of which £904,000 represents the cost of the 132-kv transmission lines to be built by the EAP&L between Kindaruma and Juja Road Substation, Nairobi.

38. From the foregoing it will be seen that the total capital employed in the Kenya electric supply industry at the end of 1967 will be about £27 million, all of which has been obtained on a purely commercial basis without any Government guarantee (except in the case of the above CDC loan) or direct impairment of the Government's ability to borrow. Unfortunately, it seems unlikely that the companies will be able to raise the necessary capital for future development without government assistance in some form or another. The present price of the EAP&L Company's shares on the London Stock Exchange is about Sh16/-, giving a yield of 10 percent, and reflects the uncertainty about the future of the Company in investor's minds. Moreover, the Company last year agreed to a dividend limitation of 8 percent in the course of negotiations for a tariff increase. In addition, the Government is under pressure from certain sections of the Kenya public to nationalize the Company. These factors will either make it impossible or unreasonably expensive for the Company to raise money from its traditional sources in the future. Since the alternative is likely to be expensive, a relatively high degree of self-financing will be necessary in future; and with dividends limited to 8 percent, tariffs can be safely increased to provide for this.

39. The Government is currently discussing with the Company the possibility of extending supplies to 24 administrative centers situated at remote points from the Company's present networks. All these centers come within the category of sub-economic rural development of social or political importance to the Government. The capital cost of providing initial supplies to them will be of the order of £515,000 and annual losses on existing tariffs would be about £56,000. Both the Government and the Company have adopted a progressive and enlightened approach to this problem. On the one hand, the Government accepts the view that the Company cannot be expected to carry an excessive amount of losses from such areas and special financial arrangements may be necessary; and on the other hand, the Company recognizes the need for a public service, such as this, to carry out a certain amount of sub-economic development in the public interest. There can be little objection to such developments provided they are carried out in modest stages over a period of years, they are not so extensive as to affect the overall economies of the public utilities operations, and they do not result in excessive charges in the more developed areas which may be required to subsidize them. It is generally accepted that subsidies, if necessary, should be given directly to the organizations requiring them and not indirectly through such things as electricity rates. For this reason, it is desirable that electricity rates in sub-economic areas should be as high as the traffic will bear after making due allowance for the possibility, if any, of promoting growth of the demand to economic levels.

### Tariffs

40. Electricity rates are controlled in Kenya by the Government with the assistance of a Power Advisory Board which keeps a close check on the EAP&L Company's accounts and all matters affecting consumer interests. The Board is composed of members of the public nominated by the Kenya Government, principally from the commercial community. It meets at irregular, but fairly frequent, intervals as the need arises.

41. The Government's approach to rates has been pragmatic. Last year it approved changes in rates in order to assist the Company in generating the funds necessary to complete its portion of the financing of the Kindaruma project and to meet rising costs. At the same time rates were standardized throughout the up-country areas. The effect of these changes, which became effective in October 1966, is to increase revenue in 1967 by about 8 percent, rising to 15 percent in 1969 as long-term agreements expire and are adjusted.

42. The EAP&L's rate structure has been designed to make the most effective use of capital assets. Off-peak water heating tariffs and concessions to larger industries for off-peak working have enabled the Nairobi and West Kenya area to operate for some years at an annual load factor of around 72 percent. In fact the weekday load factor is around 80 percent. For the past two years, with the oil refinery in operation, the Coastal System load factor has been equally high. Part of this high load factor is due to the very effective use of rhythmic control systems to disconnect the relatively large domestic water heating load over the peak period.

43. In Kenya the average cost of energy to the consumer in 1965 on tariffs other than power was 37 percent lower than in Uganda and 16 percent lower than in Tanzania. On the other hand, because 25 percent of Kenya's power had to be generated by thermal means compared with 18 percent in Tanzania and none in Uganda, and also because the return on capital investment is higher in Kenya than in the other two territories, the average cost of all energy supplied to consumers was only 9 percent less than in Tanzania and 15 percent higher than in Uganda.

44. In 1966 the Government and the EAP&L jointly commissioned a tariff expert to carry out a review of all Kenya tariffs. His report is expected early in 1967.

### Future Demand

45. In 1963, the EAP&L commissioned the consulting firm of Merz & McLellan to carry out a market survey of the demand for electricity in Kenya for the period, 1964-74, and also to forecast the possible growth rates in the various areas of supply from 1975 to 1983. A summary of the results of this forecast for the years, 1962-75 is given in Table 7.

46. Comparison with the actual sales for the four years 1963-66 (see Table 7) shows that, while the forecast for Nairobi and West Kenya was only slightly above the actual figure for 1966, the forecast for the Coastal Area greatly exceeded the actual demand. This error arises almost entirely from an overestimate of the demand of the new oil refinery which started production

in 1964 and the extension of the Bamburi cement factory. Since there is reason to believe that this is due only to a lag in the timing of the oil refinery's and cement company's plans for development, the actual demand may catch up with the estimates in the future to some extent. Industrial demand in 1965 was only about 5 percent below the forecast in Nairobi, but nearly 24 percent below at the Coast for the reason given above. Other demands were about 14 percent below the forecast in Nairobi and 12 percent at the Coast.

47. The Merz & McLellan report takes into account all the factors which might be expected to have influenced the trend of demand, including the reduction in the rate of increase in domestic demand following independence in 1964, as a result of the replacement of expatriate consumers by Kenyans (whose initial demand is usually less than that of their predecessors), and the departure of British troops.

48. There are no major centers of population or development in Kenya outside the existing areas of supply which by their connection to the EAP&L's network could cause an appreciable increase in demand. The Company is currently discussing with the Government plans for new supplies to be provided for 24 administrative centers, as mentioned in paragraph 39, but the demand from these areas is likely to be insignificant for many years.

49. The only known prospective industrial consumers of over 500 kw maximum demand are shown in Table 8. In addition, a proposal to build a pulp mill at Broderick Falls has been under consideration for many years, but there are no indications that this load will materialize before 1970. In the case of existing power consuming industries, most are anticipating annual increases in production of around 10 percent a year over the next five years and some, such as canning, textiles and woodworking, are expecting annual increases of between 25 percent and 50 percent.

50. In the absence of any other known major factors, it is probable that the failure of demand to reach the figures forecast by the consultants has been largely due to a "wait and see" attitude on the part of the residential and commercial communities, particularly in regard to the possibility of exchange control. This may be a transient phase and the noticeable increase in confidence in the past year has been reflected in an 8 percent increase in sales during 1966 as compared with only 2 percent in 1965.

51. The EAP&L at the request of the Kenya Government has recently commissioned from their consultants a "National Power Development Plan 1966-1986." This plan is now in preparation and final conclusions have not yet been drawn. Nevertheless, it can be said that the previous forecast of demand has been revised and tentative figures (still subject to revision) are shown in Table 7. These may well prove to be unduly pessimistic, but they are a reasonable basis on which to plan at this stage.

#### Capital Program

52. The development plan prepared by the consultants for the period 1966-1986, outlines the following sequence of developments for Kenya in the seven years 1967-1973.

<u>Year of Commissioning</u>	<u>Development</u>	<u>Installed Capacity MW</u>
1968	First Stage Seven Forks hydro-electric project at Kindaruma	40
1970	Gas turbine at Nairobi	15
1971	Additional steam unit at Mombasa	30
1971	132-kv Transmission Mombasa-Nairobi	-
1973	Additional steam unit at Mombasa	30
1974	Gas turbine for peaking at Mombasa	15
1975	Additional unit at Kindaruma	20

The above developments would be followed by development of the major stages of Seven Forks in the period, 1975-1980. The above plan is still subject to alteration in the light of studies still in progress by the consultants and is based on the assumption that Kenya will continue to import 30 MW from Uganda. Any major change in the Bulk Supply Agreement with Uganda would probably require a radical revision of the whole development program with more emphasis on hydroelectric development.

53. The Kindaruma project now under construction by the TRDC has only very limited water storage because the Company intends to provide major storage at more suitable sites upstream in later stages of the Seven Forks project. Until these later stages are built, Kindaruma can only operate as a run-of-river project with limited pondage and greatly reduced firm capability in a dry year. Moreover, as soon as the first 20 MW unit is commissioned at Kindaruma at the end of 1967 or early 1968, the KPC is obliged to reduce its agreed maximum permitted import from Uganda from the present 45 MW, to 30 MW. In a severe dry season, therefore, the Kindaruma project will contribute little or nothing to the firm capability of the system until upstream storage has been provided, and with the reduction in the Uganda bulk supply, it may even reduce the capability of the system. However, once upstream storage is provided, Kindaruma will have a firm capability of 60 MW, as the additional water will justify addition of another 20 MW machine. Any new circumstances, therefore, which would justify provision of upstream storage at an early date, would be in the general interests of the Kenya supply industry.

54. It is probable that in fact such a new circumstance justifying the provision of upstream storage already exists and will continue to exist for most of 1967, but it is not likely to exist again for perhaps twenty years or so thereafter. The new circumstance is the desire of the Uganda Electricity Board to defer expenditure on another major hydroelectric project on the Nile at Bujugali and to enter into some form of cooperation with Kenya over the joint development of major power resources in the two countries (see paragraphs 60-64 below).

55. In the absence of any firm decision at this stage to enter into

cooperation with Uganda, the Kenya companies' plans for development of major projects in the next four years, 1967-70, will probably be based on the sequence shown in paragraph 52 above. Other capital developments in the category of generating equipment in the period include additions to existing isolated diesel stations at minor undertakings such as Meru, and provision of diesel generating stations at the new sub-economic undertakings of Homa Bay, Lamu, Kajiado, Isiolo, Voi, Kisii and Narok. Of these sub-economic developments, only Homa Bay and Lamu are authorized at present. Other capital expenditure on transmission and distribution is mainly on account of reinforcement and reconstruction of existing mains, extensions to new consumers and provision of distribution systems in the sub-economic undertakings mentioned above.

56. Estimated capital expenditure in the four-year period, 1967-70, is £14,197,000, 1/ of which about £9,130,000 (approximately \$25.5 million) would be foreign exchange. So far, only £5,597,000 2/ (approximately \$15.6 million) of foreign exchange has been found and the balance of £3,533,000 or about \$9.9 million has still to be raised. Assistance in financing the foreign exchange element of the Mombasa steam station extension and the Nairobi/Mombasa line would just about cover the balance required to complete the program. Tables 9 and 10 show respectively the estimated capital expenditure for the four years, 1966-70, and the sources of funds.

#### Future Strategy

57. There are no known deposits of fossil fuels in Kenya and the cost of transporting fuel or transmitting large amounts of energy over the 300 miles separating the Coast from Nairobi and the Kenya highlands, where by far the majority of the population is resident, makes thermal generation expensive. Nuclear power at the present stage of development of Kenya and the nuclear power industry could not be justified on economic grounds within the next twenty years or more. There is, however, a great hydroelectric potential in the Tana River which drains the Mount Kenya and Aberdare mountain ranges. Some of the known potential projects totaling 1,000 MW are shown on the map attached to this report. All of these are situated within a reasonable distance of the main load center of Nairobi.

58. It is not possible to comment in detail at this stage on Kenya's development strategy since old plans are now being reviewed and a new strategy is in process of development. Some generalizations can however be made, which ought to be taken into consideration in formulating new plans.

59. It is clearly in Kenya's interest to make the best use of its only known natural resource in the field of energy. This is the hydroelectric potential of the Tana River. Not only would this make Kenya independent of overseas sources for its energy supplies, with consequent savings in foreign exchange, but in the long run it is likely to provide the cheapest source of energy and, at the same time, enhance the potential for agricultural development in the lower Tana basin. It will also provide employment and development

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1/ Since revised to £14,840,000.

2/ This includes the CDC loan referred to in Para. 37(i).

of new skills for many Kenyans. Most hydroelectric development is costly in the initial stages and the full benefits are not reaped until projects are fully loaded. It is therefore an advantage to load such projects to their full capacity as quickly as possible. This is not easy in Kenya with its present relatively low load base and growth rate. However, there is an opportunity during the next ten to twelve months to double the load base through a joint power development program with Uganda.

60. Uganda has a similar problem in developing its hydro potential on the Nile. Its demand is now only a little less than Kenya's but the growth rate is a little higher. It is now faced with the need to provide additional generating facilities and the capital cost of doing so will impose a heavy burden of capital charges on electricity consumers until the project can be fully loaded, which may take eight to ten years from the date of commissioning.

61. If Kenya and Uganda could agree to join forces and share the cost of developing their hydroelectric resources, both countries would benefit from the reduction in power costs which would result from the doubling of the rate at which projects would be loaded. In that event, their capital commitments would also be halved. Moreover, it would justify a closer examination of some larger and possibly more attractive projects in both countries which have so far been excluded from detailed consideration on account of their large size. Cooperation on these lines would be facilitated by the existence of the Tororo/Nairobi bulk supply lines which for some years, with minor modifications at the terminals, is probably all that would be required for a two-way exchange of power. Moreover, the fact that both countries have several comparable hydroelectric projects for development should mean that neither country will become unduly dependent on the other for its supplies of power.

62. Cooperation in its simplest form could be achieved by the creation of a joint authority for all major generation and transmission in the two countries. In Kenya, the only assets which the new authority would need to take over are those of the TRDC and KPC which could be acquired by the Kenya Government by purchase of the other interests' shareholdings. However, if cooperation in this form is not acceptable to the two Governments at the present stage, it is probable that some looser form of cooperation could be devised to bring about substantial (though probably not as great) savings to both countries.

63. Whatever political difficulties may or may not exist in Kenya and Uganda in the way of the type of cooperation suggested here, there can be no doubt that, at this point in the development of both countries, substantial economic advantages would accrue from cooperation. The establishment of a committee to explore the possibilities and evaluate the benefits, whilst in no way committing any of the parties to future action, would at least ensure that any subsequent decisions are made with a knowledge of the facts.

64. Because Uganda must reach a decision whether to proceed or not with the building of its next station on the Nile by the end of 1967 or early in 1968, it is essential that the question of cooperation be resolved within the next twelve months. If a decision is not reached within this period, the opportunity is unlikely to arise again within the next twenty years or more, and both countries may be obliged to commit very much larger sums to electrical development in the immediate future than would otherwise be necessary.

65. Aside from the question of cooperation with Uganda, there is a need to coordinate the plans for hydroelectric development in the middle reaches of the Tana River and irrigation in the lower Tana basin. For some years now, the Government of Kenya has been employing consultants to investigate the potential for irrigation in the lower Tana basin. The final report of the consultants was to be made in May 1967, and though no conclusions have yet been published, such information as is available indicates the need for the closest cooperation between the power and irrigation authorities in the matter of provision of major water storage dams in the middle or upper reaches of the river. The problem is undoubtedly complicated by the difficulty of assessing the benefits that are likely to flow from irrigation given the problems involved in developing profitable patterns of irrigated agriculture.

66. In considering future strategy, the question arises as to whether in the prevailing circumstances private enterprise can continue to find the increasingly large amounts of capital which are required for future developments, and if not, whether the present representation on the Boards of the companies and the controls on dividends and electricity rates, etc. are adequate for the Government's purpose, having regard to the manifest benefits which can be obtained from allowing private enterprise to continue running what is essentially a commercial operation. To assist the Government in formulating its policy with regard to these questions, it has appointed a committee to look into and report upon the advantages and disadvantages to be obtained from acquisition of the companies by the Government.



Table 1: THE EAST AFRICAN POWER & LIGHTING COMPANY LIMITED: MAXIMUM DEMANDS, 1950-65

(in MW)

	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965
Nairobi & West Kenya		(	21.2%		)											
Average Annual increase %		(						9.3%								)
Nairobi & West Kenya	14.50	18.40	20.91	25.76	31.30	33.96	36.10	38.58	39.90	47.77	54.30	54.70	57.28	57.63	63.12	62.62
Nakuru	0.98	1.15	1.24	1.45	1.67	2.01	2.14	2.22	2.30							
Kisumu	0.45	0.59	0.68	0.86	0.96	1.08	1.22	1.22	1.22	1.20						
Eldoret	0.71	0.73	0.73	0.78	0.79	0.86	0.91	0.94	0.96	1.00	1.08	1.06	1.08	1.08		
Nyeri	-	-	-	-	-	-	-	-	-	-	0.96	0.96	0.95	0.86	0.93	
Kitale	0.20	0.22	0.30	0.34	0.37	0.42	0.46	0.50	0.52	0.55	0.50	0.53	0.55	0.58	0.50	0.53
Nanyuki	0.08	0.09	0.16	0.22	0.35	0.40	0.44	0.44	0.42	0.45	0.48	0.60	0.59	0.57	0.55	0.53
Meru	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.07
Coast	3.66	3.84	4.65	5.10	7.38	8.60	9.73	11.23	12.05	13.61	14.80	14.65	15.34	17.56	19.40	19.80
Coast Average Annual Increase %		(						11.9%								)
Total All Areas	20.58	25.02	28.67	34.51	42.82	47.33	51.00	55.13	57.37	64.58	72.12	72.50	75.79	78.28	84.50	83.55
All Areas		(	20.1%		)	(		9.0%		)	(		3%			)
Average Annual Increase %		(						9.8%								)

Source: The East African Power & Lighting Co. Ltd.

Table 2: THE EAST AFRICAN POWER AND LIGHTING COMPANY LIMITED: SALES OF ELECTRICAL ENERGY 1950-65

(In millions of KWH)

TARIFF	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	
<b>NAIROBI &amp; WEST KENYA</b>																	
Residential	16.31	22.60	27.93	32.98	38.27	44.25	51.32	55.34	58.47	61.77	68.44	70.99	72.83	74.96	75.96	73.89	
Water Heating and Pumping	10.69	12.77	16.61	15.92	21.27	24.70	30.61	35.34	40.63	45.38	51.71	54.43	66.13	66.89	66.17	69.22	
Lighting only	4.53	5.37	5.91	6.31	7.52	8.29	9.00	9.03	9.08	9.36	11.68	13.17	3.43 a/	3.61	4.00	4.23	
Commercial	7.51	8.91	10.20	11.43	14.07	16.79	19.47	20.07	21.74	25.55	30.23	32.99	48.96 a/	51.70	56.43	51.46	
Industrial Power	22.47	26.57	31.15	41.42	46.36	55.87	59.27	63.31	70.07	83.14	95.05	103.88	99.65	107.57	110.33	115.30	
Public Lighting	0.82	0.99	1.09	1.62	3.29	4.56	5.06	4.75	5.25	5.38	5.68	6.21	6.71	7.06	7.37	7.47	
Miscellaneous	-	-	-	-	-	-	-	-	1.30	1.62	1.71	1.70	1.55	1.64	1.69	1.85	
<b>TOTAL</b>																	
Nairobi & West Kenya	62.33	77.21	92.89	109.68	130.78	154.46	174.73	187.84	206.54	231.20	264.50	283.37	299.26	313.43	321.95	323.42	
Average Annual Increase %	(								11.6%								)
<b>COAST</b>																	
Residential	3.62	4.66	5.90	6.79	7.49	8.49	9.86	11.05	11.48	11.96	12.72	12.93	13.52	14.08	13.72	13.51	
Water Heating and Pumping	0.48	0.56	1.02	1.50	1.91	2.47	2.86	3.58	3.69	3.85	4.36	4.46	4.48	4.64	4.57	4.60	
Lighting only	1.57	1.60	1.83	2.04	2.24	2.44	2.83	3.11	3.26	3.27	3.41	3.60	1.48 a/	1.40	1.37	1.40	
Commercial	1.77	1.83	1.94	2.28	2.47	2.64	2.97	3.28	3.58	4.40	5.09	5.61	7.21 a/	10.43	11.57	12.24	
Industrial Power	5.66	5.20	7.35	7.98	13.72	20.33	25.17	28.55	33.74	41.08	44.44	45.78	46.26	48.04	71.04	77.47	
Public Lighting	0.12	0.15	0.17	0.24	0.40	0.42	0.47	0.52	0.72	0.70	0.76	0.80	0.83	0.87	0.94	0.97	
Miscellaneous	-	-	-	-	-	-	-	-	0.30	0.32	0.38	0.48	0.46	0.51	0.54	0.56	
<b>TOTAL - Coast</b>	13.22	14.02	18.21	20.83	28.23	36.79	44.16	50.09	56.77	65.58	71.17	73.66	74.24	79.93	103.75	110.75	
Average Annual Increase %	(								15.25%								)
<b>TOTAL COMPANY SALES</b>																	
Total Sales - All Areas	75.55	91.23	111.10	130.51	159.01	191.25	218.89	237.93	263.31	296.78	335.66	357.03	373.50	393.36	425.70	434.17	
Average Annual Increase %	(								12.3%								)

a/ In 1962, many consumers changed from the "lighting only" tariff to the "commercial" tariff to take advantage of a change in the tariff structure.

Source: The East African Power & Lighting Co. Ltd.

Table 3: INSTALLED GENERATING PLANT & BULK SUPPLY (EAP&L AND KPC) END-1967

<u>Power Station</u>	<u>Type of Prime Movers</u>	<u>Site Rating in KW</u>	<u>Total Station Capacity in MW.</u>
<u>NAIROBI &amp; WEST KENYA</u>			
<u>EAST AFRICAN POWER &amp; LIGHTING COMPANY LIMITED</u>			
Nairobi South (Main)	Diesel	15,164)	19,564
	Gas Turbine	4,400)	
Nairobi South (Temporary)	Diesel	3,500	3,500
Ruiru (Nairobi)	Diesel)	450)	1,950
	Hydro )	1,500)	
Ndula (Thika)	Hydro	2,450	2,450
MESCO (Fort Hall)	Hydro	350	350
Nakuru	Diesel	4,400	4,400
Kisumu	Diesel	1,965	1,965
Eldoret	Diesel	1,600)	1,960
	Hydro	360)	
<u>KENYA POWER COMPANY</u>			
Wanji (Fort Hall)	Hydro	7,940	7,940
Tana (Fort Hall)	Hydro	15,200	15,200
Bulk Supply (Uganda)	-	30,000	<u>30,000</u>
Total Capability Nairobi & West Kenya			92,279 KW
Firm Capability (approximately)			<u>84,000 KW</u>
<u>COAST AREA</u>			
Kipevu (Mombasa)	Steam	40,000	40,000
Mbaraki (Mombasa)	Diesel	6,000	6,0000
Malindi	Diesel	240	<u>240</u>
Total Capability Coastal Area			46,240
Firm Capability			<u>33,740</u>
Kitale	Diesel	1,230	1,230 (930 firm)
Nanyuki	Diesel	1,445	1,545
	Hydro	100	(845 firm)
Meru	Diesel	348	348 (246 firm)

Source: The East African Power & Lighting Co. Ltd.

Table 4: FINANCIAL STATISTICAL RECORD OF THE EAST AFRICAN POWER AND LIGHTING COMPANY LIMITED a/

	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965
Revenue from Sale of Electricity	£ 2,183,413	£ 2,592,902	£ 2,891,631	£ 3,111,514	£ 3,496,892	£ 3,700,718	£ 3,845,913	£ 4,081,850	£ 4,407,003	£ 4,588,776
Profit for the year before Taxation	593,834	803,902	796,932	975,062	1,118,722	1,003,239	1,113,791	1,170,408	1,169,853	1,192,391
Debtore Stock Redeemed	-	-	-	-	81,204	101,064	157,457	170,307	120,033	-
Taxation (Net)	593,834 49,875	803,902 66,681	796,932 65,010	975,062 81,930	1,037,518 85,361	902,175 70,535	956,334 150,275	1,000,001 168,403	1,049,820 255,304	1,192,391 313,788
Net Profit after Taxation	543,959	737,221	731,922	893,132	952,157	831,640	806,059	831,698	794,516	878,603
Preference Dividends (Gross)	93,000	93,000	93,000	93,000	96,500	96,500	96,500	96,500	96,500	96,500
Net Profit attributable to Ordinary Stockholders	450,959	644,221	638,922	800,132	855,657	735,140	709,559	735,198	698,016	782,103
Ordinary Dividend (Gross)	369,093	394,376	408,217	579,563	607,475	607,475	607,475	607,475	607,320	607,320
Profit and Reserves Retained	£ 81,866	£ 249,845	£ 230,705	£ 220,569	£ 248,182	£ 127,665	£ 102,084	£ 127,723	£ 90,696	£ 174,783
NET CASH FLOW										
Profit and Reserves Retained	81,866	249,845	230,705	220,569	248,182	127,665	102,084	127,723	90,696	74,783
Depreciation	394,729	421,794	434,068	470,522	503,655	527,023	541,582	578,921	607,815	620,807
	£ 476,665	£ 674,639	£ 664,773	£ 691,091	£ 751,837	£ 654,688	£ 643,666	£ 706,644	£ 698,511	£ 695,590
CAPITAL EMPLOYED										
Fixed Assets, less Depreciation	7,011,594	7,509,497	7,642,583	7,895,160	8,238,913	8,782,938	9,026,067	9,040,040	9,128,960	9,995,556
Subsidiary and Associate Companies	3,805,548	3,890,439	3,793,708	3,769,922	3,765,346	3,462,070	3,283,208	3,293,151	449,903	357,058
Amount outstanding on Sale of Tanganyika Subsidiary (after deducting Future Interest)	-	-	-	-	-	-	-	-	2,613,311	2,292,794
Net Current Assets	1,146,362	1,543,094	1,725,131	1,736,782	1,938,058	1,849,961	1,545,508	1,634,483	1,661,698	2,59,891
	£12,663,962	£12,943,030	£13,161,522	£13,401,864	£13,942,317	£14,094,969	£13,854,783	£13,967,674	£13,853,872	£12,905,299
Financed by:										
Ordinary Stockholders' Interests	6,807,224	7,046,547	7,425,841	8,499,557	9,169,738	9,424,994	9,449,204	9,762,095	10,029,539	10,292,126
Preference Capital	2,100,000	2,100,000	2,100,000	2,100,000	2,150,000	2,150,000	2,150,000	2,150,000	2,150,000	2,150,000
5% Convertible Debenture Stock 1960/69 (Secured)	3,417,500	3,407,300	3,193,700	2,316,600	2,048,900	1,921,309	1,721,309	1,521,309	1,211,160	-
Future Taxation Reserve	339,244	389,132	441,981	485,707	573,679	598,666	534,270	463,173	463,173	463,173
	£12,663,962	£12,943,030	£13,161,522	£13,401,864	£13,942,317	£14,094,969	£13,854,783	£13,967,674	£13,853,872	£12,905,299
ORDINARY DIVIDEND RATES										
On Issued Capital	7%	8%	8%	10%	10%	10%	10%	10%	*8%	8%
On Capital Employed	2.91%	3.05%	3.10%	4.32%	4.36%	4.31%	4.30%	4.35%	4.36%	4.71%
PROFIT for the year before Taxation as a Percentage of Average Capital Employed	4.71%	6.28%	6.11%	7.34%	8.18%	7.16%	7.9%	8.41%	8.39%	8.91%
CAPITAL EXPENDITURE	£ 1,335,040	£ 903,893	£ 566,228	£ 644,142	£ 827,011	£ 1,036,033	£ 751,846	£ 550,593	£ 674,619	£ 915,615
UNITS SOLD (MILLIONS)	220.4	239.6	263.3	297.8	335.8	357.0	373.5	393.4	425.7	434.0

a/ Calendar years

b/ On increased capital

c/ Pension Fund Payment, £100,000

Source: Annual Reports of the East African Power & Lighting Co. Ltd.

Table 5: BALANCE SHEET OF THE KENYA POWER COMPANY LIMITED AT DECEMBER 31, 1965

	<u>£</u>	<u>£</u>
<u>Fixed Assets</u>		
Land, Building, Transmission Lines, Plant, Machinery and Licences at Cost		7,488,403
<u>Current Assets</u>		
Reserve and Equalisation Fund		
Marketable Securities at cost (Market Value £121,248)	116,993	
Short-Term Deposit	10,000	
Cash at Bank	<u>3,148</u>	
	130,141	
Stores (less Reserve £19,166)	38,004	
Sundry Debtors	3,841	
Short-Term Deposits	170,000	
Cash at Bank	<u>3,007</u>	<u>344,993</u>
		7,833,396
Deduct: <u>Current Liabilities</u>		
Sundry Creditors and Accrued Charges	14,710	
Interest Accrued on 5-1/2 percent Debenture Stock 1975/85	<u>81,537</u>	<u>96,247</u>
		<u>£7,737,149</u>
<u>Capital Authorised and Issued</u>		
100 Shares of Shs. 20/- each, fully paid		100
<u>Capital Reserve</u>		
Transfer from Reserve and Equalisation Fund Account, being Appropriation for Capital Expenditure approved by the Authorised Distributor		65,767
<u>Revenue Reserve</u>		
Reserve and Equalisation Fund Account		
Balance as at 31st December, 1964	168,665	
Allocated 1965	22,500	
Interest on Investments	<u>4,743</u>	
	195,908	
Less: Transferred to Capital Reserve as above	<u>65,767</u>	130,141
<u>Debenture Stock Sinking Fund</u>		
Balance as at 31st December, 1964	1,425,926	
Allocated 1965	191,683	
Discount on Stock Redeemed during year	<u>57,979</u>	1,675,588
<u>Loan Capital</u>		
5-1/2 percent Debenture Stock 1975/85 (Secured)	7,500,000	
Less: Redeemed	<u>1,634,447</u>	<u>5,865,553</u>
		<u>£7,737,149</u>

Source: Annual Report of the Kenya Power Company.

**Table 6:** INCOME AND EXPENDITURE ACCOUNT OF THE KENYA POWER COMPANY LIMITED  
FOR THE YEAR ENDED DECEMBER 31, 1965

Expenditure:	£	£
Generation	91,062	
Electricity Purchased in Bulk	418,099	
Distribution	74,181	
Management (less: Interest Receivable, etc. £6,155)	27,766	
Auditors' Remuneration	287	
Directors' Remuneration	4,200	
	<hr/>	615,595
Debenture Stock Interest	326,224	
Debenture Stock Sinking Fund	191,683	
Reserve and Equalization Fund	22,500	
Stores Depreciation Reserve	2,859	
	<hr/>	543,266
Ascertained Cost		1,158,861
Income, being actual price charged to the Authorized Distributor		<u>1,158,861</u>
		<hr/>

NOTE: The above Account is with respect to the agreed Cost of 333,472,900 kwh of Electrical Energy supplied to the Authorized Distributor, The East African Power and Lighting Company, Limited, computed in accordance with the Nairobi and Western Kenya (Bulk Supply) Agreement, 1955 and Bulk Supply Licence No. 2 of 8th June, 1955, resulting in a price to the Authorized Distributor of 6.9503 cents per kwh.

Source: Annual Report of the Kenya Power Company.

Table 7: THE EAST AFRICAN POWER AND LIGHTING COMPANY LIMITED: ESTIMATE OF KWH SENT OUT, 1962-75

(in millions)

Area	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
Nairobi	283.2	294.2	314.2	340.8	373.3	417.0	469.7	532.8	602.3	678.0	760.0	848.0	942.0	1046.0
Nakuru	22.5	22.6	24.8	27.6	30.1	33.2	36.7	40.4	44.4	48.6	53.1	57.7	62.5	67.5
Kisumu	13.4	15.2	17.7	20.5	24.1	26.7	31.1	36.2	41.7	47.7	54.0	60.7	67.6	74.7
System total	319.1	332.0	356.7	388.9	427.5	476.9	537.5	609.4	688.4	774.3	867.1	966.4	1072.1	1188.2
Actual	360.4	358.6	379.0	386.6	411.0									
Coast	82.0	93.9	121.5	150.9	173.8	198.4	226.7	158.8	294.2	332.3	374.8	420.4	469.6	518.7
Actual	87.9	96.3	119.1	125.8	131.0									
Eldoret	5.3	5.7	5.8	6.0	6.4	7.0	7.7	8.5	9.3	10.2	11.1	12.1	13.1	14.1
Kitale	2.4	2.6	2.6	2.7	2.8	3.1	3.4	3.8	4.2	4.5	5.9	5.4	5.8	6.3
Nanyuki	2.3	2.3	2.4	2.4	2.5	2.7	2.9	3.2	3.4	3.7	4.0	4.3	4.6	5.0
Nyeri	4.4	4.4	5.3	6.9	7.5	8.2	9.0	10.0	11.0	12.1	13.2	14.3	15.6	16.8
Total, All Areas	415.5	440.9	494.3	557.8	620.5	696.3	787.2	893.7	1010.5	1137.1	1275.1	1422.9	1580.8	1749.1
Actual	463.0	470.3	507.0	513.6										
20 year development plan forecast					517.0	553.0	595.0	646.0	707.0	781.0	866.0	959.0	1062.0	1174.0
Average annual increase %								( 8-1/2%				( 10-3/4%		

## ESTIMATE OF MAXIMUM DEMAND

(All figures in MW)

Nairobi	49.00	40.60	54.50	59.70	65.80	74.80	85.30	97.70	111.40	127.10	144.00	161.00	181.00	203.00
Nakuru	4.20	4.40	4.80	5.30	5.75	6.32	6.98	7.70	8.45	9.26	10.10	11.00	11.90	12.85
Kisumu	2.60	2.90	3.35	3.83	4.49	4.94	5.72	6.65	7.66	8.77	9.94	11.15	12.40	13.70
System total <sup>a/</sup>	54.10	56.10	66.70	66.70	73.90	83.50	95.10	108.90	123.80	141.00	159.20	178.00	199.00	222.50
Actual	57.28	57.67	63.12	62.62	65.92									
Coast	14.70	16.50	21.30	26.50	30.80	35.40	40.70	46.90	53.70	61.20	69.50	78.70	88.50	98.60
Actual	15.34	17.56	19.40	19.80	20.40									
Eldoret	1.06	1.10	1.13	1.15	1.23	1.35	1.49	1.64	1.80	1.97	2.15	2.33	2.52	2.72
Kitale	0.54	0.57	0.58	0.59	0.62	0.68	0.75	0.83	0.91	0.99	1.08	1.17	1.27	1.37
Nanyuki	0.57	0.55	0.56	0.58	0.61	0.66	0.71	0.77	0.84	0.91	0.99	1.07	1.17	1.25
Nyeri	0.93	0.94	1.17	1.58	1.71	1.87	2.06	2.28	2.50	2.75	3.00	3.27	3.54	3.83
Total, All Areas <sup>a/</sup>	71.90	75.76	85.44	97.10	108.87	123.46	140.81	161.32	183.55	208.82	235.92	264.54	296.00	330.27
Actual	75.79	78.28	84.50	83.55										
20 year development plan forecast					88.0	95.0	104.0	115.0	128.0	143.0	160.0	179.0	200.0	223.0
Average annual increase %								( 10%				( 11-3/4%		

<sup>a/</sup> These totals allow for 3% diversity between Nairobi, Rift Valley and Nyanza Areas

Source: Merz and McLellan report dated Feb. 1964 on "Market for Electricity."

Table 8: LARGE INDUSTRIAL CONSUMERS OF ELECTRICITY EXPECTED TO BE CONNECTED, 1967-71

Nature of Industry <u>a/</u>	Estimated Maximum Demand (in kw)	Estimated kwh a year	Location
1. Caustic Soda	2000	16,800,000	Mazeras (Mombasa)
2. Fruit canning	2000	10,000,000	Thika
3. Pressed steel furniture ) Woollen goods )	500	670,000	Limuru
4. Fertilizers	1000	6,200,000	Mombasa
5. Sugar Factory (Irrigation & Housing)	550	1,150,000	Chemelil (Kisurun)
6. Vegetable canning	1250	2,430,000	Lugari (Eldoret)

a/ With the exception of Nos. 3 and 5, tentative enquiries for supplies have been received, but whether the loads will materialize is not yet certain. Furthermore, there is a possibility that a wood pulp mill may apply for a connection in the Broderick Falls Area at some time in the period considered.

Source: The East African Power & Lighting Co. Ltd.

Table 9: KENYA ELECTRICAL POWER INDUSTRY (PUBLIC UTILITIES):  
ESTIMATED ANNUAL CAPITAL EXPENDITURE, 1966-70 a/  
(in £ thousands)

	1966	1967	1968	1969	1970	Remarks
1st Stage Seven Forks (Kindaruma 40 MW)	1,500	3,280	500	-	-	
Reinforcement existing Diesel Stations	-	6	-	7	-	
Sub-Economic Government Projects	-	13	16	31	74	
Future Major Power Station Development	-	-	600	800	700	£900,000 to complete in 72/73 (60 MW Steam Station Mombasa)
<b>Total Generation</b>	<u>1,500</u>	<u>3,299</u>	<u>1,116</u>	<u>838</u>	<u>774</u>	
Kindaruma/Nairobi 132kv Line & Substation	600	200	-	-	-	
Miscellaneous H.T. & L.T. Distribution	400	1,010	1,210	1,480	1,870	
Nairobi/Mombasa 132kv Line & Substations	-	-	-	1,000	1,400	£100,000 to complete in 1971
<b>Total Transmission &amp; Distribution</b>	<u>1,000</u>	<u>1,210</u>	<u>1,210</u>	<u>2,480</u>	<u>3,270</u>	
<b>Grand Total</b>	<u>2,500</u>	<u>4,509</u>	<u>2,326</u>	<u>3,318</u>	<u>4,044</u>	
Estimated Foreign Exchange in above Totals	<u>1,500</u>	<u>2,400</u>	<u>1,350</u>	<u>2,430</u>	<u>2,950</u>	

a/ Calendar Years.

- NOTES: 1. The above program is based on the assumption that there would be no change in the existing arrangements for importing 30 MW of power from Uganda.
2. As the Power Authorities Consultants are at present in the early stages of developing a 20-year plan for power development in Kenya and have not finally established the optimum economic program, the above estimates can only be regarded as tentative.

Source: The East African Power & Lighting Co. Ltd.  
and Balfour Beatty & Co. Ltd.

Table 10: KENYA ELECTRICAL POWER INDUSTRY (PUBLIC UTILITIES):

ESTIMATED CAPITAL EXPENDITURE & SOURCES OF FUNDS, 1966-70 a/

(in £ thousands)

		1966	1967	1968	1969	1970
Investment	Foreign Exchange	1,500	2,400	1,350	2,430	2,950
	Local Currency	1,000	2,109	976	888	1,094
	Total	<u>2,500</u>	<u>4,509</u>	<u>2,326</u>	<u>3,318</u>	<u>4,044</u>
	Cash brought forward	450	Nil	644	96	Nil
	Annual Surplus	170	470	200	450	650
	Depreciation	620	640	700	740	780
	Capital Contributions	20	20	20	30	30
Resources	Sale, Tanganyika Company <u>b/</u>	358	358	358	358	358
	CDC Loan <u>c/</u>	382	2,618	500	-	-
	Suppliers' Credits	500	1,047	-	-	-
	Balance <u>d/</u>	Nil	(644)	( 96)	1,644	2,226
	TOTAL	<u>2,500</u>	<u>4,509</u>	<u>2,326</u>	<u>3,318</u>	<u>4,044</u>
	Foreign Exchange obtained	1,240	4,023	858	358	358
	Additional Foreign Exchange Required <u>d/</u>	260	(1,623)	492	2,072	2,592

a/ Calendar Years

b/ Payment being received over 12 years

c/ 1-1/4% above U.K. Bank Rate on a 20-year loan for Kindaruma Project

d/ ( ) indicates Surplus

Source: Mission estimate based on information supplied by The East African Power & Lighting Co. Ltd. and Messrs. Balfour Beatty & Co. Ltd.

THE EAST AFRICAN POWER & LIGHTING CO., LTD.  
 INSTALLATIONS IN KENYA & POSSIBLE HYDRO-ELECTRIC DEVELOPMENTS

