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INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT
INTERNATIONAL DEVELOPMENT ASSOCIATION

PROSPECTS FOR ECONOMIC DEVELOPMENT IN EAST AFRICA

(in four volumes)

VOLUME III - TANZANIA

(in seven parts)

PART SIX: ANNEX E - POWER

August 31, 1967

Africa Department

EQUIVALENTS

Currency

1 Tanzania Shilling	=	U.S. \$0.14
U.S. \$1	=	T. Sh 7.14
£ 1	=	U.S. \$2.80
£ 1	=	T. 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.

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TANZANIA POWER SECTOR

SUMMARY AND CONCLUSIONS

1. The sum of maximum demands for energy at TANESCO's branches throughout Tanzania is expected to increase at an average rate of about 11½ percent per annum in the period, 1967-75.
2. The annual increments of power demand in the Dar es Salaam/Tanga area are now becoming so large that it is unreasonable to contemplate meeting them with additional diesel generating units beyond about 1971 or 1972, by which time a new major source of energy should be commissioned.
3. Preliminary indications are that the source of power which would provide the lowest cost energy in the early 1970's is a hydroelectric station at Kidatu on the Great Ruaha River. Possible alternatives are another hydroelectric station at Pongwe on the Wami River and a steam station in Dar es Salaam.
4. In order to avoid the heavy cost of obtaining a full feasibility report on both the Kidatu and Wami Projects an independent consultant should be called in now to prepare a report setting out the rival claims of both projects on a strictly comparable basis so that a decision can be taken within the next six months as to which of the two should be carried forward to the full feasibility report stage, including comparison with the thermal alternative.
5. During the four-year period 1967 through 1970 TANESCO will need to obtain approximately £7 million (US\$20 million equivalent) for completion of its development program. Of this sum about US\$14 million will be required in foreign exchange.
6. The division of responsibility between the Ministry of Land Survey and Water Development on the one hand and the Ministry of Communications, Power and Works on the other, in the matter of development of multipurpose hydroelectric projects, requires more precise definition.
7. A hydrological survey of the power resources of the basins of the Rufiji, Ruvu, Wami and Pangani Rivers would be useful, but there would seem to be no useful purpose served by extending the survey beyond these river basins at this stage.
8. Very careful consideration should be given to the geological formations in the Kikuletwa River area before deciding to embark on the construction of a storage reservoir.

TANZANIA POWER SECTOR 1/

Introduction

1. Public supplies of electricity were first provided in Dar es Salaam, Tabora, Dodoma and Kigoma by the German East African Railway between 1907 and 1914. These undertakings were taken over by the British authorities during the first World War and were operated and extended by the Public Works Department until 1932.

2. In 1932, the Tanganyika Electric Supply Co. Ltd. (TANESCO) was formed with capital provided by The East African Power & Lighting Co. Ltd. (EAP&L) in Kenya, for the purpose of constructing a hydroelectric station on the Pangani River at Grand Pangani Falls, to supply the many sisal estate factories and other demands in Tanga Province. At the same time a second company known as the Dar es Salaam and District Electric Supply Co. Ltd. (DARESCO) was formed, with capital provided by TANESCO, to take over all the government-owned electrical utilities in the country. In exchange for the assets handed over to DARESCO, the Government received 45,000 £1 shares in the Company and a seat on the Board of Directors of DARESCO.

3. In the ensuing years the companies extended their networks and DARESCO inaugurated a number of new undertakings in important centers throughout the country. In 1957, the two companies were amalgamated under the name of the Tanganyika Electric Supply Co. Ltd. At this time the Company was operating 15 separate undertakings, each having its own generating facilities.

4. Soon after Tanganyika obtained her independence in December 1961 the Government indicated that it would like to purchase the EAP&L's interest in TANESCO, and in April 1964 an agreement was signed under which the Government purchased at par the EAP&L's 2,955,000 £1 shares in TANESCO. Since that time the Government has maintained its position as the only shareholder in TANESCO, though the Commonwealth Development Corporation has an option to convert £750,000 out of its £3,000,000 debenture stock, into ordinary shares, at any time up to December 31, 1968.

5. The Government has made no material changes in TANESCO other than in appointment of Board members since it obtained the controlling interest and the Company continues to operate as an ordinary commercial utility with the same staff as before.

Demand for Electricity

6. The sum of maximum demands at utility undertakings has grown from 12 MW in 1950 to 44 MW in 1965, which represents an average growth rate of approximately 9 percent per annum over the 15-year period.

7. Growth in recent years has been largely concentrated in the Dar es Salaam area and has been more rapid than in the past. This is mainly due to the development of secondary industries, but also very recently due to extension

1/ This report relates to the electric supply industry of Mainland Tanzania.

of the supply network into the sisal-growing areas around Morogoro, following the advent in 1964 of relatively cheap hydro power from the Hale Hydroelectric station on the Pangani River. In the years since 1947 there has been a considerable influx of secondary industries to Kenya to meet the requirements of the East African Common Market. Tanganyika obtained only a very small proportion of these industries, but in the early 1960's with independence in view, the Government of Tanganyika set about redressing this imbalance by introducing measures to attract new industries and by active participation in promotion of some industries. Owing to its situation as the principal port, railhead and center of the largest market in the country, almost all the new industries have been concentrated in the Dar es Salaam area. Table 1 shows the increases in total sales of electric power over the eight years 1958 through 1965 by areas. Table 2 shows the development of industrial energy sales over the same period.

8. In the period, 1961-65 total sales in Dar es Salaam increased at an average rate of 14.5 percent, and in the last two years the increases were 15.4 percent and 18.0 percent respectively. In the same period, industrial sales increased at an average rate of 15.5 percent with increases in the last two years of 17.5 percent and 25.3 percent respectively.

9. In the Tanga area, which with the Dar es Salaam area accounts for about 75 percent of the Company's total business, sales in the period 1960 through 1963 increased at an average rate of 7.5 percent. Since 1963, however, they have declined by 3.0 percent, due to the fact that nearly 70 percent of total sales in this area are to sisal estate factories, which have been obliged to reduce production as a result of the recent recession in the sisal industry. Sales to other customers increased by 8.6 percent in 1965 but were more than offset by a fall of 5.8 percent in sales to the sisal industry.

10. In other areas growth has been relatively slow and in the case of Tabora, Lindi and Mtwara sales have been almost static for the past four years.

Existing Facilities

11. The attached map shows the licensed areas of supply, the location of the Company's generating stations and the main transmission lines connecting areas of supply. It will be seen that the only areas of importance where interconnection has so far taken place are Moshi/Arusha and Dar es Salaam/Tanga/Morogoro.

12. The capacity of installed generating plant and maximum demand at the different power stations as of November 1966, are shown in Table 3. It will be noted that with the exception of 38,500 kw of hydroelectric plant in the Tanga area and three small hydroelectric stations totaling 2,720 kw at Moshi, Iringa and Mbeya, all generation is by diesel prime movers. Total generating plant installed consists of:

Hydroelectric plant	41,220 kw
*Diesel electric plant	<u>30,600 kw</u>
Total	<u>71,820 kw</u>

* In 63 units varying in size from 35 kw to 3,000 kw

13. Although there are valuable undeveloped coal deposits in southern Tanzania and there is a great hydroelectric potential in the country it has not been possible to utilize these resources to any great extent so far, due to their distance from the load centers and the smallness of the demand. The great distance between centers, which so far has precluded interconnection on account of the cost, except in the two areas previously mentioned, has also contributed to the existing pattern of development.

14. Supplies are given to low-tension consumers at 230 volt single phase and 400 volts 3 phase, 50 cycles A.C., and to high-tension consumers at voltages up to 11,000 volts.

15. Transmission line voltages are 33,000, 66,000 and 132,000. Lines of 66,000 volts and above are generally constructed on reinforced concrete or steel portal structures. For voltages below 66,000 volts, reinforced concrete or impregnated wood poles are used.

The Company's License

16. The supply areas covered by the Company's license are also shown on the map. The present license was issued in 1957 under The Electricity (Amendment) Ordinance (No. 3 of 1957) and expires in the year 2012.

17. The license provides for the Company to have first refusal of any additional areas to be licensed for public supplies of electricity in the country. It defines areas of "compulsory supply" within which the Company is obliged to provide a supply upon payment of the required charges by the consumers, and it lays down maximum rates which may not be exceeded for sale of energy for lighting and power. It also gives the Government the right to nominate one director to the Board of the Company, which in the period prior to acquisition of all the Company's shares by the Government, was of considerable significance.

18. Other provisions in the license provide for the designation of power development reserves at possible hydroelectric sites on rivers throughout the country, water rights on the Pangani River, the right to export power into neighboring territories, increases in maximum rates in the event of increases in taxation, the right to charge interest to capital account during construction of projects and the usual rights and obligations to protect the interests of the Company and consumers.

Organization

19. The Company's Board of Directors consists of a chairman, a deputy chairman, and six other members. All are part-time members and the present chairman and deputy chairman are the Minister of Communication, Power and Works and his Permanent Secretary, respectively. Of the remaining six members, one is a nominee of the Board of the East African Power and Lighting Co. in Kenya (for reasons given in paragraph 25), another is the East African representative of the Commonwealth Development Corporation, two are foreign advisers on loan to the Government, and the remaining two are Government officials.

20. In spite of the predominance of Government members in the composition of the Board, the Company still operates on strictly commercial lines. A new general manager has recently been provided by the British Government under a technical assistance program. With this exception no major changes in staff have occurred following acquisition of the Company by the Government, and most of the senior technical posts are held by expatriates who have served many years with the Company.

21. The Company employs consultants for all major power station and transmission works. Contractors are also employed for all major works but minor power station extensions and distribution and transmission works up to 33,000 volts are normally carried out by the Company's staff.

22. The Company's accounts department is well run, billings are up to date and outstandings are insignificant. Billing is already mechanized in the larger areas and the purchase of a computer is now contemplated. The Company has 36,790 consumers of which 22,790 are in the Coastal System Area and 4,500 in the Moshi/Arusha area.

23. The Company is efficiently run and by operating on sound commercial principles relieves the Government of a considerable financial and administrative burden. It can be regarded as a satisfactory organization for the maintenance and expansion of the country's electrical supply industry.

Financial Situation

24. At the end of 1965 the Company had an issued share capital of £5,347,535 (all of which was owned by Government), loans totaling £3 million and reserves of £751,126. Fixed assets totaled £8,438,125 and current assets exceeded current liabilities by £661,036. The Company's balance sheet for 1965 is shown in Table 4 and the revenue account in Table 5.

25. The agreement under which the Government purchased the EAP&L's shareholding at par provides for payment over 12 years. Interest is charged at six and one-half percent per annum bringing the total purchase price to £4,301,220 payable in equal semi-annual payments, the last of which is due in December 1975. Under this agreement the EAP&L has the right to nominate a director to TANESCO's Board until the last payment has been made.

26. A recent Cabinet paper issued by the Government requires the Company to operate at a profit and establishes the principle that if the Company should be required by the Government to carry out sub-economic development projects, the Government will provide subsidies to ensure a satisfactory return to the Company. Up to the end of 1965, no such requests for sub-economic development had been made to the Company but some are shortly expected. The same Cabinet paper endorses the principle that TANESCO should provide a proportion of its development finance from its own reserves and surpluses.

27. Although the return on net fixed assets was only 6.7 percent in 1965, an increase in tariffs introduced in February 1966, should bring this to a more satisfactory level in future years, and provide additional funds for expansion of facilities.

28. During 1966, the Company had difficulty in obtaining the funds necessary for the expansion of facilities required to meet the rapidly growing demand. Commercial credits totaling £752,000 repayable over five years have been obtained for supply of diesels to augment generating facilities at Dar es Salaam, Arusha and Mwanza. A 7-3/4 percent loan of £685,000 repayable over 15 years, has been obtained from the Government, and a tied loan of \$2 million has been obtained from Canada on soft terms. In addition a small loan of £150,000 repayable over 10 years is under negotiation with The Standard Bank Finance and Development Corporation Ltd. towards the cost of a headquarters office building.

29. Most of the Company's present financial difficulties arise from the suspension of a £9 million British Government loan to Tanzania, following the latter Government's severance of diplomatic relations with the U.K. in 1965. It is hoped that some of these funds will eventually become available to TANESCO for refinancing the U.K. suppliers' credits into which the Company has recently entered.

Tariffs

30. As previously mentioned, the Company's license lays down the maximum rates which may be charged for lighting and power. These rates may be changed with the consent of Government at any time after three years from the date of the previous revision. In fact, the present maximums have remained unchanged for many years and are far above the rates presently charged by the Company, leaving plenty of room for adjustment at any time required.

31. In 1965, the Company's rate structure was reviewed with the assistance of a tariff consultant. As a result of this review, rates were standardized throughout the country in February 1966, and revenue was increased by about 25 percent overall. At the same time care has been taken in fixing the new rates to ensure that so far as the business will allow, rates for different categories of consumers are related to the actual cost of supplying them. Attention has also been given to the need to raise the load factor at all undertakings in order to obtain the most effective use of the equipment installed.

32. The new rate structure contains only four standard rates - Residential, Commercial, Small Power and Large Power. In addition, there are two very large consumers on a special power tariff with off-peak concessions and there is a special tariff for street lighting. A fuel surcharge is applied in all areas supplied from thermal generating stations.

Future Demand

33. In 1963, the Company commissioned Messrs. Merz and McLellan to carry out a market survey for electric power throughout Tanganyika. These estimates forecast a total demand of 51.2 MW in 1965 compared with an actual demand of 46.5 MW. The reason for the difference is thought to be not so much failure of industrial projects to materialize, but rather delay in completing them. In support of this theory there has been a closing of the gap in 1966. Whereas the 1965 actual demand was 10 percent below the estimate, the 1966 demand was

expected to be about 7 percent below the forecast of 57.6 MW. The Company is therefore continuing to base its plans on the market survey forecast, and for the purpose of its capital program this appears to be a reasonable decision. The market survey demand estimates for all areas are shown in Table 6.

34. A comparison between the rate of increase in demand forecast by the Company, with the rate of increase in investment in the industrial sector forecast by the Bank Mission, confirms that the Company's estimates are, if anything, on the conservative side.

35. A list of some of the larger power consumers known to be requiring supplies from the Company during the next four years, 1967-1970, is given in Table 7. It will be noted that a large proportion of these are due to commerce operations in this year, which may well result in the market survey estimates for 1967 being exceeded. The paucity of large new consumers shown after 1968 does not necessarily indicate a falling off in the rate of increase in demand. The list only includes loads which are reasonably firm. Other large loads now known to be in the formulative stage and which may materialize three to four years from now are not shown, either because no firm decision has been taken to proceed with them or because financing has not yet been obtained and their future is in doubt.

36. The Company's rates are not high by East African standards and are competitive with alternative sources of energy, both for residential and industrial purposes. With the exception of wood fuel in relatively small outlying centers of population, there is no alternative source of energy available which does not have to be imported. The great distances involved in transport by road and rail within the country may in up-country areas add more than 100 percent to the price at which fuel is available at the coast. At the coast itself, the relatively cheap hydro power available from the two existing stations on the Pangani River is highly competitive with thermal alternatives.

37. The estimates of demand do not include the loads of future sub-economic projects which could be classified as rural schemes of social and political significance to the Government. The Company of its own initiative in 1965 and 1966 provided supplies to two projects which come within this category, at Tukuyu and Singida. It has also at the Government's request taken over in recent months two small supplies previously operated by the Government for its administrative centers at Nachingwea and Mpwapwa. The only other project of this nature under active consideration by Government is at Songea. However, the Company anticipates that in the next few years similar requests will be received in respect of the nine administrative centers at Njombe, Kasulu, Newala, Masasi, Tunduru, Handeni, Same, Kondoa and Ifakara. The growth rate of such undertakings is expected to be negligible in the foreseeable future, and their size in relation to the total demand on the Company is insignificant.

Capital Program

38. Estimated capital expenditure in the four years 1967 through 1970 is shown in Table 8 together with the estimated sources of funds. It will be

observed that in addition to the £1,937,000 loans already obtained and the £2,850,000 available from depreciation reserves and surpluses, the Company will need to obtain additional finance to the extent of about £10 million of which about £8 million (US\$22.4 million equivalent) will be foreign exchange. The principal projects included in the program and their costs are shown in Table 9. Of these projects, the following portions have not yet been financed but are now the subject of an application for a loan which was negotiated in July and is expected to be submitted to the Directors of the Bank in early October:

	<u>Total Cost</u>	<u>Foreign Exchange</u>
	<u>£</u>	<u>Required</u>
		<u>£</u>
Ubungo Diesel Station, Units 4, 5 and 6 (18 MW total)	829,000	790,000
Mwanza Diesel Station, Units 4 and 5 (3 MW total)	164,000	160,000
Additional 33 kv Transmission Lines	150,000	90,000
Ubungo Sub-station Extensions	78,000	59,000
Minor Distribution Works (1967-1969)	<u>1,837,000</u>	<u>758,000</u>
Total	<u>£3,058,000</u>	<u>£1,857,000</u>
US\$ equivalent	<u>\$8,562,400</u>	<u>\$5,199,600</u>

All the above works are scheduled for completion in the three years 1968 through 1970.

39. Of the projects listed in Table 9, the only ones which call for special comment are the Nyumba ya Mungu and Kidatu hydroelectric stations and Ubungo thermal station.

40. The Nyumba ya Mungu station is an adjunct to an irrigation project on the Pangani River in the Same area. It will add only about 8 MW to the gross capability of the Moshi/Arusha system but nothing to the firm capability. However, in view of its relatively low cost of about \$250 per kw installed (excluding the dam) it is fully justified on account of the savings it will permit in operation of thermal plant.

41. The Kidatu project has been shown as the next major power station addition to the Coastal Grid System. As discussed later in this report it is by no means certain that Kidatu is in fact the best choice of the possible alternatives, but whatever project is finally selected, the cost is likely to be of the same order and the incidence of expenditure is not likely to be very different from that of Kidatu.

42. The Ubungo diesel station is required to fill the gap between firm generating capability and demand during the next few years, until Kidatu or some other major power station development is commissioned. Thereafter this station would be retained for use as a peaking station and for standby purposes, and also to firm up the hydro stations on the Pangani River which have no long-term storage reservoirs.

43. Additional demand in the Moshi/Arusha area is to be met by addition of two 1.5 MW diesel engines to the existing station at Arusha. These machines should be adequate for the period under review. An 8 MW hydroelectric project, known as Moshi No. 2, on the Kikuletwa River is planned for commencement in 1970 or 1971. There are some doubts as to the desirability of creating storage reservoirs in this area due to the thinness of the impervious layers overlying highly porous layers of rock. Very careful consideration will have to be given to the geological problems before deciding to embark on this project.

44. Only minor expenditure is involved in providing the additions necessary to thermal plants at the smaller branches up country. This has been included in Table 8 with expenditure on distribution mains under the heading "Minor Extensions to Power Stations and Mains."

Future Strategy

45. With the exception of the Dar es Salaam/Tanga and Moshi/Arusha areas, which together accounted for 85 percent of the Company's sales in 1965, there is little alternative but to continue to develop supply areas in isolation with thermal plants, until such time as the loads have grown sufficiently large to warrant the high cost of interconnection due to the great distances involved.

46. With the completion of the Nyumba ya Mungu project in 1968 there will be a gap of only about 70 miles between the Moshi/Arusha network and the Dar es Salaam/Tanga network. Although the voltages of the networks are inadequate to provide useful interconnection at the nearest points, a 132 kv interconnection about 170 miles long between the Hale Power Station in the Tanga area and the Kikuletwa Power Station in the Moshi area is likely to be more economical than further extension of local generation in the Moshi/Arusha area in the early nineteen seventies.

47. In the Dar es Salaam/Tanga area the annual increments in demand are reaching proportions where it is no longer reasonable to consider meeting these with a multiplicity of diesel units. The Ubungo station is only planned to meet the system's additional needs up to 1971 or 1972. There is therefore no time to lose in deciding on the next major generating project to be developed. With this in mind, the Company has obtained from its consultants, Messrs. Balfour Beatty & Co. Ltd of the U.K., a preliminary study of the hydroelectric possibilities in the area. Ten different sites have been considered. Of these, two are on the Wami River, two on the Great Ruaha River, three on the Kilombero River and three on the Rufiji River. All these sites are shown on the map attached to this report. Of these schemes, six can be eliminated from present consideration because of their high cost, large size and/or

remoteness from load centers. Of the remaining four, one on the Wami River at Pongwe and another on the Great Ruaha River at Kidatu justify comparison on the grounds of size, location and estimated cost of power produced. Both are capable of development in stages to about 150 MW capacity.

48. The Wami project has been investigated by SWECO, a Swedish firm of consultants commissioned by the Water Development and Irrigation Department (WDID). It is a multipurpose project intended to impound water for irrigation of the lower Wami basin and generation of electric power. The total cost for the first stage of 80 MW including the dam but excluding interest during construction, would be about £16 million, and for the final development to 160 MW with an output of 700 million kwh would be £25 million. The cost of the dam has been entirely charged to power because in the Bank's view, it is unlikely that significant irrigation benefits would be realized for a long time.

49. The Kidatu scheme, which has been investigated by TANESCO's consultants and is recommended by them for immediate development, could provide irrigation benefits at a later date but has been costed as a straight power project. The total cost of the first stage of 80 MW, including the dam, transmission line and substations, would be £13.43 million, including interest during construction, engineering and contingencies, and £19.7 million for the final development to 160 MW, with an output of 800 million kwh. The cost per kwh at full development is estimated at 4.4 cents (Tanzanian) compared with 5.8 cents from a major steam station, assuming an interest rate of 6 percent on the capital invested in the project, and fuel at Sh85.00 per long ton.

50. The WDID has in the past been anxious to proceed with the Wami project under the impression that TANESCO will buy power from the project. On the other hand, TANESCO prefers to proceed with the development of Kidatu. Both schemes are regarded as multipurpose projects though the irrigation benefits are not likely to be realized until many years after commissioning of the power portion of the projects, judging from experience with similar projects in Africa and other countries which do not have a long tradition of irrigation farming. Since the investigation of the Wami project is some way ahead of Kidatu and the two schemes have not been costed on a strictly comparable basis, it is recommended that a third consultant should be asked to review the existing data, supply any additional information considered necessary, and draw up a comparison of the costs and benefits of both schemes, before any further work is undertaken on either of them. This comparison should be carried out as quickly as possible in order that the power company can commission without delay a full feasibility report on the better of the two schemes, to enable them to raise the necessary finance.

51. The extent to which the WDID has carried its investigations on the Wami project, with little regard to the requirements and alternatives available to the power authorities or to their investigation of other schemes, indicates a need to delineate more precisely the functions of this Department in relation to multipurpose projects. The planning, construction and operation of multipurpose projects in which power interests are important are best carried out by the power authorities concerned in consultation with other interested parties, since the economics of such schemes and their operation usually depend on them to a

major extent. Power benefits are realizable from the outset in multipurpose projects whereas irrigation benefits are usually slow in developing, difficult to evaluate, and less certain of success.

52. A recent proposal to carry out a complete hydroelectric survey of the country would seem to have little merit at the present time. Such a survey would be expensive and since it would cover vast areas of territory remote from any development on a large scale likely to occur in the foreseeable future, it would seem to be a waste of money. A limited survey covering areas within reach of centers of development or river basins where developments are scheduled to occur would be most valuable. In particular, a detailed survey restricted to the basins of the Rufiji, Ruvu, Wami and Pangani rivers with a view to identifying power development sites and estimating the broad parameters of projects at these sites, would be most valuable in planning development programs.

53. Interconnection with neighboring countries' networks is not feasible on a large scale at the present moment; however, both the Tanzanian Government and TANESCO have indicated their intention to keep such a possibility in mind and favor cooperation where it could be shown that this would be to the benefit of Tanzania. Tanzania has in the past exported surplus power from Pangani Falls to Mombasa in Kenya, and is currently importing small quantities of power from Uganda in the Bukoba area. There is a 700-800 MW hydroelectric project capable of development on the Rufiji River about 100 miles southwest of Dar es Salaam at Steiglers Gorge, but the cost of developing this project could not be supported by the anticipated revenue from the Coastal Area for some years. When this project can be justified however, an interconnection of the Tanzanian coastal system with the Nairobi/Mombasa system will warrant careful examination. It is probable that such an interconnection would prove beneficial to both countries.

Table 1: TANGANYIKA: ELECTRIC POWER SALES, 1958-65

(in millions of kwh)

UNDERTAKING	1958	1959	1960	1961	1962	1963	1964	1965
Dar Es Salaam	11.62	14.44	16.13	18.50	21.58	22.43	27.14	33.81
(Sisal	29.97	30.56	31.36	32.47	36.75	37.69	40.04	37.71
Tanga (Other	5.22	5.31	5.95	5.28	4.82	5.39	6.26	7.47
(Sisal	0.28	0.27	0.26	0.17	0.27)			8.39
Morogoro (Other	0.23	0.25	0.25	0.39	0.39)	0.84	2.82	0.52
Moshi	1.34	1.41	1.93	1.97	2.08	2.81)		
Arusha	1.33	1.30	1.37	1.58	1.75	2.03)	6.18	6.94
Dodoma	0.17	0.16	0.21	0.20	0.24	0.21	0.23	0.38
Tabora	0.45	0.28	0.14	0.21	0.22	0.19	0.13	0.26
Kigoma	0.11	0.15	0.15	0.15	0.17	0.19	0.24	0.26
Mwanza	0.62	0.52	0.54	0.65	0.76	0.97	1.04	1.18
Bukoba	-	-	-	0.02	0.12	0.17	0.14	0.13
Mbeya	0.07	0.06	0.09	0.10	0.09	0.09	0.11	0.12
Iringa	0.37	0.39	0.43	0.44	0.47	0.79	1.09	1.27
Lindi	0.05	0.04	0.07	0.09	0.07	0.10	0.06	0.07
Mtwara	0.10	0.07	0.11	0.27	0.15	0.10	0.08	0.08
TOTAL	<u>51.93</u>	<u>55.21</u>	<u>59.09</u>	<u>62.49</u>	<u>69.93</u>	<u>74.00</u>	<u>85.56</u>	<u>98.59</u>
Percentage increase over previous year.		6.4	7.1	5.7	11.9	5.8	15.6	15.2

Table 2: TANGANYIKA: INDUSTRIAL ENERGY SALES, 1958-65

(in millions of kwh)

UNDERTAKING	1958	1959	1960	1961	1962	1963	1964	1965
Dar Es Salaam	31.22	35.37	40.04	45.66	53.23	58.20	67.18	79.27
Tanga	43.60	45.37	46.73	46.83	53.01	58.00	58.74	56.33
Morogoro	1.47	1.55	1.70	1.75	2.01	2.28	4.36	10.97
Moshi	5.21	5.60	6.57	7.04	7.51	7.43)	15.30	16.54
Arusha	3.67	3.86	4.29	4.78	5.36	6.04)		
Dodoma	0.98	1.15	1.29	1.38	1.53	1.61	1.69	1.93
Tabora	1.42	1.41	1.36	1.55	1.78	1.82	1.75	1.92
Kigoma	0.30	0.34	0.37	0.39	0.46	0.53	0.62	0.67
Mwanza	2.98	3.12	3.43	4.00	4.17	4.47	4.68	4.85
Bukoba	-	-	0.08	0.44	0.74	0.81	0.95	1.07
Mbeya	1.09	1.28	1.39	1.46	1.45	1.56	1.66	1.87
Iringa	1.27	2.09	2.33	2.35	2.36	2.60	3.00	3.38
Lindi	0.52	0.53	0.59	0.63	0.60	0.60	0.59	0.60
Mtwara	0.45	0.42	0.48	0.69	0.64	0.59	0.58	0.65
TOTAL	<u>94.19</u>	<u>102.09</u>	<u>110.63</u>	<u>118.95</u>	<u>134.85</u>	<u>146.54</u>	<u>161.10</u>	<u>180.05</u>
Percentage increase over previous year.		8.4	8.4	7.5	13.4	8.7	9.9	11.8

Table 3: INSTALLED PLANT AND MAXIMUM DEMANDS, OCTOBER 1966

Branch of Undertaking	Type of Prime Mover	Installed Capacity		October 1966	1965
		Gross KW	Firm KW	Maximum Demand in kw.	Load Factors %
Dar Es Salaam)	Diesel	16,700)	44,700	40,250	53.0
Tanga)	Hydro	38,500)			
Moshi)	Hydro	1,160)	4,660	3,880	53.9
Arusha)	Diesel	4,300)			
Mwanza	Diesel	2,060	1,560	1,580	46.7
Iringa	Hydro	1,220	330	730	58.8
Tabora	Diesel	980	660	592	44.2
Dodoma	Diesel	1,210	870	700	45.9
Mbeya	Hydro	340)	420	580	45.1
	Diesel	320)			
Bukoba	Diesel	800	640	402	39.0
Mtwara	Diesel	540	340	340	31.7
Kigoma	Diesel	850	550	245	44.0
Lindi	Diesel	480	280	202	43.1
Nachingwea	Diesel	250	100	80	-
Musoma	Diesel	365	200	61	-
Singida	Diesel	270	150	68	-
Mpwapwa	Diesel	100	75	58	-
Tukuyu	Diesel	185	110	17	-

- NOTES: a. As the altitude of Branches varies from sea level to 6,000 feet, the plant capacities given above are the site ratings, which in many cases are less than the nameplate ratings.
- b. Annual load factors are not available for the five smallest Branches.

Table 4: TANGANYIKA ELECTRIC SUPPLY COMPANY LIMITED: BALANCE SHEET AS AT DECEMBER 31, 1965

	<u>£</u>		<u>£</u>	<u>£</u>
Authorised Capital	£5,500,000.			
<u>Issued Capital</u>	5,347,535.	<u>Fixed Assets</u>		
<u>Capital Reserve</u>	157,011.	At Net Book Amount at 31.12.1965	£ 418,218.	
<u>Revenue Reserves</u>		Additions since at cost	<u>11,320,564.</u>	
Development	£200,000.			£11,738,782.
General	320,000.			
Revenue Account	<u>74,615.</u>	Less: Depreciation Account		
	594,615.	at 31st December	118,628.	
	594,615.	Accumulated to date	<u>3,354,657.</u>	
			3,473,285.	
<u>Loan Capital</u>			<u>3,473,285.</u>	
C.D.C. 7 ¹ / ₂ % Sterling			8,265,497.	
Deb. Stock (Secured)	3,000,000.			8,265,497.
<u>Current Liabilities</u>		Motor Vehicles, Furniture & Equip.	348,054.	
Sundry Creditors	£417,196.	Less: Depreciation	<u>175,426.</u>	
East African & UK Tax	<u>45,001.</u>		172,628.	
	462,197.			172,628.
	462,197.	<u>Current Assets</u>		
		Stores (Less £10,000 reserve)	501,630.	
		Sundry Debtors	218,940.	
		Investments at cost	9,900.	
		Cash	<u>392,763.</u>	
			1,123,233.	
				1,123,233.
	<u>£9,561,358.</u>			<u>£9,561,358.</u>

NOTE: Outstanding Capital Commitments not provided in the balance sheet amount to £625,000 of which £24,200 is recoverable from consumers.

Table 5: TANGANYIKA ELECTRIC SUPPLY COMPANY LIMITED:

REVENUE ACCOUNT FOR YEAR ENDING

DECEMBER 31, 1965

	<u>£</u>		<u>£</u>
Administration & General Expenses	30,532	Operating Surplus & Sundry Receipts	1,048,728
Depreciation of Tools, etc.,	10,214	Income from investments and Deposits	17,181
Depreciation of Fixed Assets:			
Land, Buildings & Machinery, etc.	406,895		
Motor Vehicles, Furniture & Equipment	<u>34,253</u>		
	441,148		
Remuneration of Auditors	3,427		
Directors Fees	3,426		
Stamp Duty on increase in Authorised Capital	7,500		
Loss on sale of investments	2,813		
Interest on Debenture Stock (Gross)	340,000		
Preliminary & Development expenditure written off	111		
Net Revenue for the year carried down	<u>226,738</u>		
	<u>£1,065,909</u>		<u>£1,065,909</u>
Provision for U.K. Income Tax	4,739	Net Revenue for the year brought down	226,738
Dividends on Stock, Gross	196,600	Balance brought forward from last year	249,216
Development Reserve	200,000		
Balance carried forward	<u>74,615</u>		
	<u>£ 475,954</u>		<u>£ 475,954</u>

Table 6: TANGANYIKA ELECTRIC SUPPLY COMPANY LIMITED

MARKET SURVEY ESTIMATES, 1965-75 a/

MAXIMUM DEMANDS

(in KW)

UNDERTAKING BRANCH	1965 (Actual)	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
Dar Es Salaam		24,500	28,500	33,600	39,200	46,100	53,500	61,500	70,500	79,800	89,200
Morogoro		6,480	7,080	7,749	8,440	9,220	9,880	10,530	11,240	11,950	12,690
Tanga		<u>18,100</u>	<u>19,600</u>	<u>20,900</u>	<u>22,200</u>	<u>23,500</u>	<u>24,900</u>	<u>26,400</u>	<u>28,000</u>	<u>29,600</u>	<u>31,400</u>
System Total		37,600	46,600	52,500	59,100	66,400	74,900	83,900	93,600	104,100	115,300
Moshi		1,640	2,830	3,090	3,380	3,700	4,100	4,510	4,980	5,490	6,650
Arusha		<u>2,080</u>	<u>3,010</u>	<u>3,500</u>	<u>4,070</u>	<u>4,770</u>	<u>5,350</u>	<u>6,110</u>	<u>6,910</u>	<u>7,800</u>	<u>9,720</u>
System Total		4,040	5,260	5,940	6,710	7,630	8,510	9,570	10,700	11,970	14,750
Dodoma		560	560	610	670	730	790	860	920	1,000	1,160
Tabora		590	740	810	880	960	1,040	1,130	1,210	1,310	1,510
Kigoma		220	220	230	250	270	290	310	350	380	460
Mwanza		1,360	1,950	2,140	2,380	2,660	2,980	3,320	3,690	4,130	5,130
Bukoba		372	420	460	500	550	600	660	720	780	910
Mbeya		550	550	580	610	650	700	750	800	850	980
Iringa		710	670	700	730	760	820	880	940	1,000	1,150
Lindi		200	230	230	240	240	250	260	270	280	300
Mtwara		<u>300</u>	<u>380</u>	<u>410</u>	<u>450</u>	<u>490</u>	<u>540</u>	<u>590</u>	<u>650</u>	<u>720</u>	<u>870</u>
		46,502	57,580	64,610	75,520	81,340	91,420	102,230	113,850	126,520	153,520

a/ By Messrs. Merz and McLellan

Table 7: TANZANIA: LARGE INDUSTRIAL POWER CONSUMERS EXPECTED TO BE CONNECTED IN NEXT FIVE YEARS

LOCATION	NATURE OF INDUSTRY	Additions to estimated Maximum Demand in KW					Ultimate Estimated kwh Consumption
		1967	1968	1969	1970	1971	
Dar Es Salaam	Friendship Textile Mill	4,500	-	-	-	-	30,000,000
	Steel Rolling Mill	6,000	-	-	-	-	78,000,000
	Nitrogen Plant	6,000	-	-	-	-	28,000,000
	B. R. Group Textile Mill	1,250	-	2,700	-	3,500	21,000,000
	Cement Works (Expansion)	-	1,500	-	-	-	6,000,000
	Tasini Textiles	-	1,000	-	-	-	11,000,000
	Hilton Hotel	750	-	-	-	-	3,500,000
	University College	500	-	-	-	-	3,000,000
	New Parliament Building	-	500	-	-	-	1,500,000
	Jubilee Trust Building	-	500	-	-	-	1,500,000
	Bank of Tanzania	-	400	-	-	-	960,000
	Police Headquarters	300	-	-	-	-	500,000
	Hotel Afric	300	-	-	-	-	500,000
	N. D. C. Headquarter	-	300	-	-	-	1,000,000
	TanESCO Head Office	250	-	-	-	-	1,750,000
	E. A. R. & H. (Ubungo)	200	-	-	-	-	500,000
	New Government Offices	200	-	-	-	-	750,000
	Belbase Building	200	-	-	-	-	500,000
	National Library	150	-	-	-	-	900,000
	Mwanza	Sodefra Textile Mill	1,500	3,400	-	-	-
Edible Oil Factory		750	-	-	-	-	268,000
Brewery		-	500	-	-	-	1,200,000
Mtwara	Cashew Nut Factories	250	500	-	-	-	12,000,000
Kwaragara/Handeni	Sisal	200	40	40	40	40	500,000
Ngambo	Sisal	-	-	-	200	100	1,000,000
Bumbuli	Hospital	-	-	-	100	-	240,000
Tanga	Blanket Factory	100	-	-	-	-	100,000
Amani	Tea Research Station	50	-	-	-	-	75,000
Moshi	Hospital	-	300	200	-	-	1,000,000
Same	Magnesite Mine	-	-	2,000	-	-	5,000,000
Moshi	Tanning Factory. Hide and Skins - Torch batteries and cells.	500	-	-	-	-	700,000
Himo	Sisal	-	500	-	-	-	Not known.
Arusha	Fertiliser Plant	-	-	300	-	-	" "
Arusha	Tanning Factory	-	-	250	-	-	" "
Moshi	Bag Factory	-	500	250	-	-	1,500,000
Arusha	Biscuit Factory	200	-	-	-	-	500,000
Arusha	Textile Factory (Kiltex)	1,100	650	-	2,250	-	35,000,000
Arusha	Soap Factory	-	200	-	-	-	300,000
Arusha	Hotel	150	-	-	-	-	300,000

Table 8: CAPITAL PROGRAM AND SOURCES OF FINANCE OF
TANGANYIKA ELECTRIC SUPPLY COMPANY LIMITED
(in £ thousands)

	1967	1968	1969	1970	
<u>GENERATION</u>					
(i) Included in the Plan	1,581	462	347	265	
(ii) Kidatu Hydro Station (not in the Plan) including transmission	-	700	3,420	4,020	Balance of £5,290,000 incurred in 1971 and 1972 to complete the project
<u>TRANSMISSION & DISTRIBUTION</u>					
(iii) Included in the Plan	988	286	96	191	
(iv) Minor extensions to Power Stations and Mains (not included in the Plan)	473	532	615	690	
<u>BUILDINGS</u>					
(v) New Headquarters in Dar es Salaam (not in the Plan)	175	10	-	-	
TOTAL	3,217	1,990	4,478	5,166	£14,851
Foreign exchange element in above total	2,039	927	2,200	3,900	£9,066
<u>SOURCES OF FINANCE</u>					
Internally generated cash	811	467	829	743	
Government loan	685	251	-	-	
Commercial credits	731				
Canadian loan	324	36			
Loan for Office Building	133	17			
TOTAL FUNDS AVAILABLE	2,684	771	829	743	£5,027
Additional Finance Required (Foreign and Local)	533	1,219	3,649	4,423	£9,824

NOTE: The Plan referred to above is the Government's Five-Year Development Plan 1966 through 1970.

Table 9: TANGANYIKA ELECTRIC SUPPLY COMPANY LIMITED

PRINCIPAL PROJECTS INCLUDED IN THE 1967-70

PROGRAM OF CAPITAL DEVELOPMENT

PROJECT	Expenditure	Estimated	Estimated Date
	in Program Period	Total Cost	of Completion
	E	E	
Nyumba ya Mungu Hydro Project	468,000	710,000	1968
Ubungo 30 MW Diesel Station	1,623,000	1,673,000	1970
Kidatu Hydro Project	8,140,000	13,430,000	1972
5 Additional Diesels of 1.5 MW each at Mwanza and 2 at Arusha	494,000	494,000	1968
66 kv line NYM to Moshi)			1967
66 kv line Moshi/Arusha)	923,000	923,000	1967
132 kv line Chalinze/Morogoro)			1967
33 kv Feeders	150,000	150,000	1969
Ubungo Sub-Station Extensions	148,000	148,000	1969
Moshi/Kikuletwa 66/33 kv Sub-Station	82,000	82,000	1969
Headquarters Office Dar es Salaam	185,000	185,000	1968
Hale & Ilala Sub-Station extensions	158,000	158,000	1970
Additional Diesels Coastal Area	70,000	900,000	1971
Computer Installation	100,000	100,000	1968
	<u>12,541,000</u>	<u>18,953,000</u>	
Minor Extension to Power Stations & Mains	<u>2,310,000</u>		
TOTAL DURING PLAN PERIOD	<u>14,851,000</u>		

