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MINI HYDRO ELECTRIC GENERATION IN TANZANIA*

by

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I. INTRODUCTION

Tanzania is a relatively small consumer of electric power with a national maximum demand of just over 130MW and total sales of 587GWh in 1978. This is less than 35KWh per capita. Total installed usable capacity is about 148MW hydro electric and 39MW thermal. Population and demand centre are distributed throughout the country in regions of favourable climate and geography. Therefore while demand for electricity is relatively small, the electric system to serve the load centres is geographically large. Most of the main demand centres are interconnected by more than 1,000 km of 132kV and 220kV transmission line. This existing grid system accounts for over 85 percent of all electricity sales. The remaining 15 percent is accounted for in 17 isolated branches scattered throughout the country, most of them being supplied from diesel stations. Figure 1 shows the layout of the national grid system, existing and proposed.

Commercial power generation and supply in Tanzania is the sole responsibility of the Tanzania Electric Supply Company (TANESCO). This is a wholly publicly owned company. The Government of Tanzania through TANESCO is engaged in a process of providing power to all the people gradually as and when economic conditions permit. As of now very few places in the rural areas are supplied with electricity. The situation is changing as electrification of villages and small towns is being given the priority it deserves - at par with social welfare activities like road construction, water supply schemes, sewage disposal etc.

II. PRESENT STATUS OF MINI-HYDRO GENERATION IN TANZANIA

At present the large hydro potential (2,100 MW with a potential firm yield of about 19,000GWh) is being exploited by the construction of large hydro schemes. In 1980 the Kidatu Stage II Project, a 100MW addition to the 100MW capacity Stage I, will be commissioned. Another large scale project in the pipeline is the Stiegler's Gorge Power Project. Studies have determined its full potential at 1200MW.

Unfortunately, until recently little has been done to develop small hydro stations. TANESCO operates three small hydro stations whose combined installed capacity is 2.6MW compared to a total hydro installed of 143MW in the country. The three stations are:-

(a) Tosamaganga on the little Ruaha River, with an installed capacity of 1120KW

(b) Kikuletwa with an installed capacity of 1160KW. This station is on the Pangani River.

(c) Mtwalisi on Mtwalisi River. This has an installed capacity of 340KW.

Besides the TANESCO operated stations, there exist other sixteen privately owned small hydro stations. The majority of these were established by Missionaries to provide power to themselves and the institutions they run e.g. hospitals, schools, etc. Their capacities range from 3KW to [illegible]. Appendix I gives a listing of these stations.

III. POTENTIALS AND PROSPECTS OF DEVELOPING MINI-HYDRO SCHEMES IN TANZANIA

The South-west of Tanzania has a lot of potential for small hydro generation schemes. This is borne out of a study carried out by the Ministry of Water, Energy and Minerals in 1976. The study covered fifty-two rivers. It showed the existence of large resources scattered along the Rift Valley from Ruvuma to Kigoma. The 52 rivers included in the report possess approximately 800KW of firm power capacity, i.e. 6,000MWh. Installed capacity is expected to amount to 1,100MW. Of the 52 rivers investigated, 31 could have an installed capacity of less than 5MW each. These are listed in Appendix 2.

Other investigated potential sites for small hydro schemes are:

Ngono River in West Lake	2.5MW
Kirilya River in Mwanza	2.1MW
Mjomba Hydro Electric Project	1.5MW

IV. PROBLEMS AND CONSTRAINTS

(a) There is a need to inform and educate people in the utility industry and those related to it - especially those in position to make decisions on energy strategies about the merits of small hydro generation schemes. Most of them have not been exposed to this power resource. Their experience is mainly with large schemes.

(b) To implement the mini-hydro schemes requires capital just like most development projects. The ability of developing countries to raise capital is very limited. With the main source of funds being external borrowing, the constraints are availability of capital markets, repayment terms and interest rates. Fortunately the World Bank and its associated bodies have been keen on financing rural development projects in developing countries and it should not be too difficult to rally this organization and others to this worthy cause.

(c) While it is true that human settlements generally concentrate near to water supplies, the same may or may not be suitable for hydro power generation schemes. Neither is every site suitable for micro-hydro schemes necessarily habitable. Some kind of persuasion would be necessary to get people to live near places with mini-hydro potential. The Villagization Programme in Tanzania could be deployed to effect this.

V. CONCLUSION

Mini-hydro power generation is now considered an established practise in many countries including the most advanced and highly developed ones. This power can be derived from water drops available in various forms:

(i) Small rivulets, streams and falls
(ii) Irrigation releases and distribution canal drops

The experience in many countries has shown that harnessing these resources is an attractive, economical proposition.

We in Tanzania now have a Rural Electrification Programme in full gear. Small towns and villages are getting electric power as and when financial resources permit. The approach has been to connect these loads to the grid or to a local system where possible. Another alternative has been to build small diesel stations. Tanzania has the necessary hydrological resources for the establishment of mini-hydro schemes. Where such resources exist they should be given priority over diesel generation. We are all too aware of the ever rising prices of oil. Let us not forget too that oil is not an unlimited resource whereas water, given a favourable rainfall pattern, is. The economic viability has to be established first. The simple designs of the mini-hydro plants might make some people weary. One or two pilot schemes could first be introduced to test the durability of these units.

VI. BIBLIOGRAPHY

1. The Hydro-Power and Irrigation Study of Western Tanzania
   Ministry of Water, Energy and Minerals
   Dar es Salaam
   April 1976

2. Experiences with Small Hydro-Electric Power Stations in Tanzania
   Henry Kadete and Roland Reichel
   University of Dar es Salaam
   September 1978

3. Tanzania Power Sector Study
   Acres International Limited
   Niagara Falls, Canada
   February 1978

APPENDIX I

SMALL HYDROPOWER INSTALLATIONS IN TANZANIA NOT OWNED BY TANESCO

NAME	SIZE
1. Swiss Coffee Plantation Utengule/Mbeya	?
2. Mbarali State Farm Mbeya	160KW
3. Ngare Sero Mt. Lodge Arusha	12MW
4. Sakarani Mission Soni	5KW
5. Magereza, Project Kitay Songea	45KW
6. Catholic Mission Nyagao Lindi	20KW
7. Moravian Mission Isoko, Tukuyu	10.5KW
8. Procure Benedictine Fathers Uwemba, Njombe	100KW
9. Bulongwa Hospital Njombe	180KW
10. Sem nary Kaengesa Sumbawanga	40KW
11. Moravian Mission Rungwe Tukuyu	21KW
12. Benedictine Fathers Peramiho Songea, Installation St. Marus Hanga	30KW
13. Benedictine Fathers Peramiho Songea, Installation Lumbila Uyassa	3KW
14. Catholic Mission Nyagao Lindi	14KW
15. Moravian Mission Isoko Tukuyu	7KW
16. Ndolage Hospital Kamachumu, Bukoba	44KW

SOURCE: EXPERIENCES WITH SMALL HYDRO-ELECTRIC POWER STATIONS IN TANZANIA:

Henry Kadete and Roland Reichel

University of Dar es salaam.

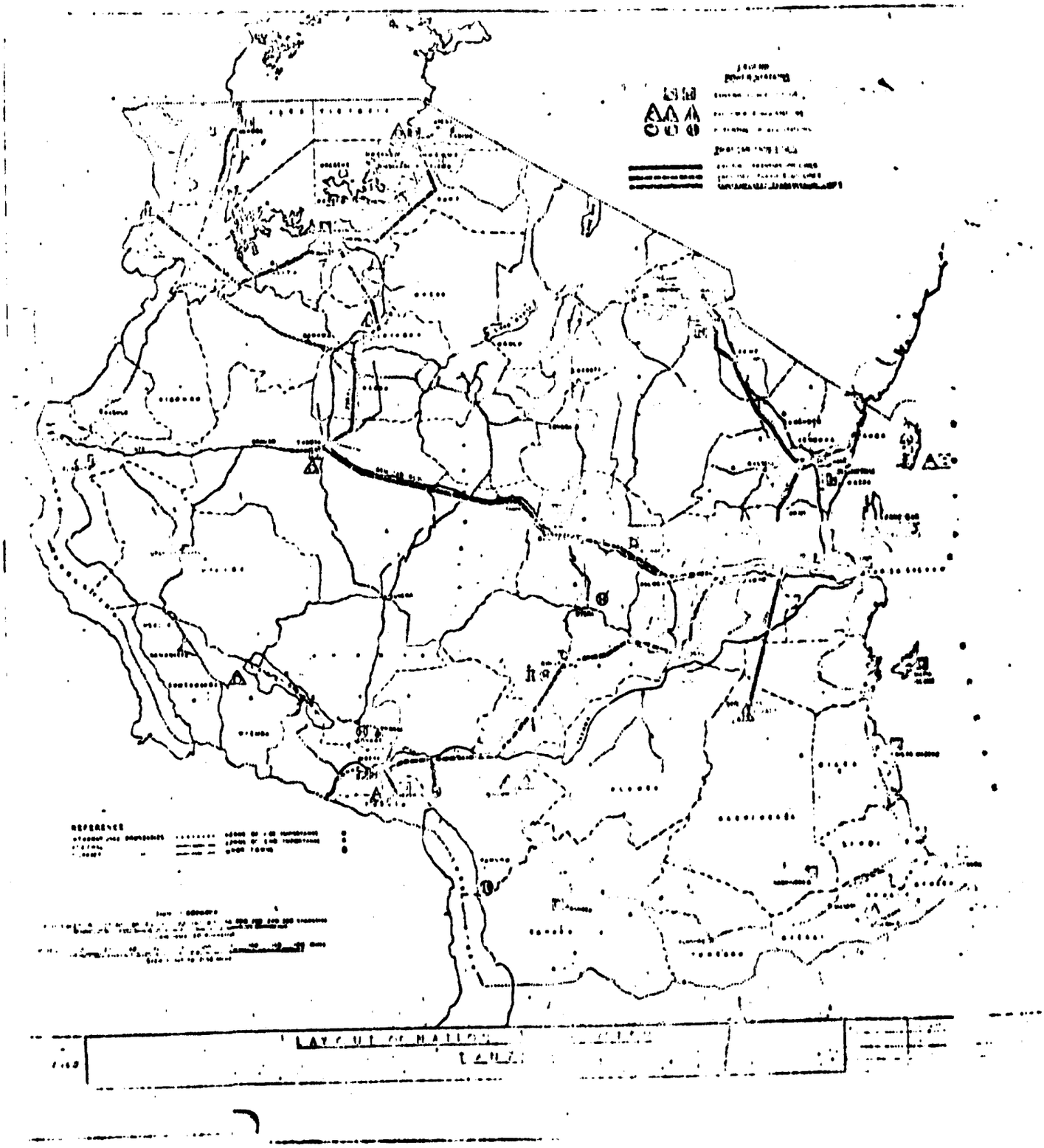
APPENDIX 2

REGISTER OF RIVERS INVESTIGATED FOR SMALL HYDRO POTENTIAL IN WESTERN TANZANIA

	NAME OF RIVER	DISTRICT OF LOCATION	INSTALLED CAPACITY(MW)
1.	Yungu	Mbinga	0.09
2.	Mbawa	Mbinga	1.0
3.	Luwika	Mbinga	1.4
4.	Luaita (Mbinga)	Mbinga	0.19
5.	Upper Ruvuma	Songea	2
6.	Hanga	Songea	0.55
7.	Lilondi	Songea	1.4
8.	Kitiwaka	Njombe	5.1
9.	Malisa	Njombe	1.25
10.	Kiwira (upstream)	Kyela	3
11.	Lupa	Chunya	2.8
12.	Waka	Chunya	2.5
13.	Yeye	Chunya	2.5
14.	Lukima	Mpanda	4
15.	Mtozi	Ufipa	2.4
16.	Mbede	Ufipa	1.24
17.	Mamba	Ufipa	0.15
18.	Kilongo	Ufipa	0.41
19.	Mpete	Ufipa	0.05
20.	Chulu	Ufipa	0.85
21.	Kirambo	Ufipa	0.28
22.	Muse	Ufipa	0.52
23.	Luiche	Ufipa	1.1
24.	Milepa	Ufipa	0.4
25.	Mba	Ufipa	3
26.	Kilemba	Ufipa	0.53
27.	Kawa	Ufipa	2
28.	Luamfi	Ufipa	1.2
29.	Mtambo	Mpanda	2.4
30.	Ruchugi	Kigoma/Kasulu	1
31.	Mkuti	Kigoma	0.63

SOURCE: THE HYDRO-POWER AND IRRIGATION STUDY OF WESTERN TANZANIA- Ministry of Water, Energy & Minerals. 1976

Figure 1 - Layout of national grid system, Tanzania



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