

EAST AFRICAN RECORD

THE GENERATION OF HYDRO-ELECTRIC POWER ON THE LOWER PANGANI RIVER

The most important aspect of the development of the Pangani river basin has so far been the exploitation of its high hydro-electric potential which derives from a combination of favourable factors. The successive rapids on the lower reaches of the river provide a head of water which facilitates the installation of hydro-electric power plants. The Pangani has a high minimum flow mainly due to the contribution of a number of springs in the foothills of Kilimanjaro. The character of the river permits a gradual expansion of generating capacity and therefore avoids the problem of spare capacity consequent upon a large investment while the demands for power grows. Much the most important of these considerations, however, is the fact that the bulk of the power generated in Tanzania is consumed in the north and east, that is in the Coast, Tanga, Moshi and parts of Arusha and Morogoro Regions and all these can be economically supplied with hydro-electric power from the Pangani.

The first hydro-electric power station on the lower Pangani was established at Pangani Falls, at the rapids immediately above the coastal belt, some 40 miles from Pangani, by a German company as early as 1936. The Tanganyika Electric Supply Company Ltd. (TANESCO), now a government concern, subsequently took over the Pangani Falls hydro-electric station and expanded its capacity to 17,500 kilowatts, the maximum attainable at this site with the minimum flow at the time of 450 cusecs.* Various considerations initiated plans for the installation of another plant at Hale, some five miles upstream of the Pangani Falls. These were the steady rise in power requirements in the Tanga Region and the possible export of power in an emergency to Mombasa, both previously supplied from the Pangani Falls plant, coupled with the anticipated sharp increase in the consumption of power in the Coast Region and the potential demand along the central railway as far as Kilosa, hitherto supplied from diesel-powered stations. The £5 million Hale hydro-electric project, which represents the largest single investment in Tanzania since the abortive groundnuts scheme, was inaugurated on 21st November, 1964. It has an output of 21,000 kilowatts and is the biggest power station yet built in the country.

The project involved the construction of two weirs across the lower Pangani: a storage weir, with a crest length of 1100 ft., regulates the flow of water and 2½ miles downstream an intake weir, with a length of 1,340 ft., diverts the water to feed the turbines. The Pangani is now dry for about 1½ miles at minimum river flow. The safety gates are opened when the river is in spate to lower the water level behind the two weirs. The water at the intake weir is diverted to the head-race tunnel, 16 ft. 6 in. wide and 4,200 ft. long, flows down a pressure shaft 270 feet deep, divides at the power station to feed the two turbines, and then passes out through a tailrace tunnel, 16 ft. 6 in. wide and 2,200 ft. long and rejoins the

*cusec: a rate of flow of one cubic foot per second.

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river to drive the turbines downstream at Pangani Falls. The fact that the two tunnels and the generating hall are underground, carved out of solid rock, makes the station unique in East Africa. Both the Hale and Pangani hydro-electric stations are operated as one electrical system, with a maximum output of 38.5 megawatts, nearly one-third of the installed capacity of the Owen Falls station, and power is brought to many communities and estates in the north and east of the country.

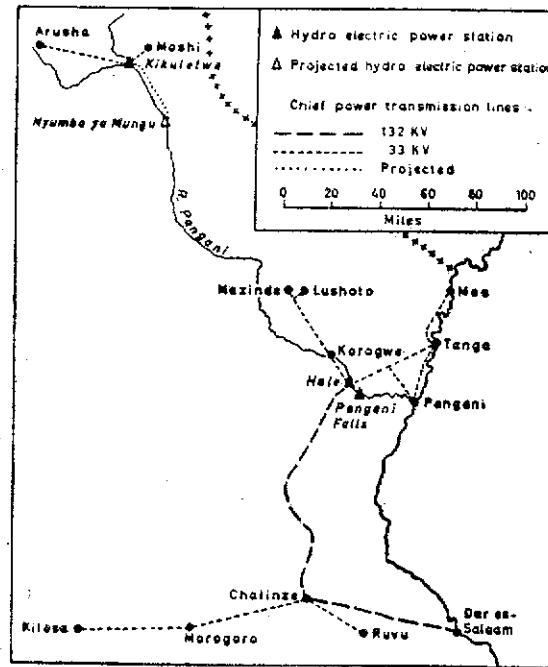


Figure 1. Power stations on the Pangani River, showing transmission lines.

The two weirs were both built for a power river flow of 700 cusecs but the realisation of this specification entailed a decision to construct a dam at Nyumba ya Mungu, some 45 miles from Moshi. The £1 million dam of a rock-fill type will stretch for more than 1,300 ft. across the river and will impound 920,000 acre-feet of water, forming a lake which will spread over 57 square miles. The project, scheduled to be completed by mid-1966, also makes provision for the establishment of a hydro-electric plant at the dam site with a capacity of 6,000 kilowatts to supply the Moshi-Arusha area. This will be electrically connected with the existing station at Kikuletwa near Moshi which has an output of 1,160 kilowatts. The dam is designed to facilitate control over the river and would thus guarantee a minimum flow for power generation at Hale and benefit subsequent stages of hydro-electric development on the lower Pangani. It will at the same time serve

the proposed irrigation areas in Lower Moshi, Same and Korogwe districts. The importance of this facet of the project in an area of increasing population pressure on the land needs no emphasis.

The inauguration of the Hale hydro-electric project is most opportune, for an adequate supply of electricity, at a reduced effective price, is now assured to industrial enterprises which the government intends to attract during the period of the Five Year Development Plan. Besides, the Hale development has reduced TANESCO's requirements of diesel gas oil by 75 per cent, and has consequently resulted in an annual saving of foreign exchange of about £270,000 which represents the cost of the fuel oil used for electricity generation in the Coast Region.

The surge in the demand for power especially in the Dar es Salaam area is expected to necessitate the temporary operation of the diesel plant in the capital by 1967 and the installation of another hydro-electric plant on the Pangani River by 1968. This further development of the power potential of the Pangani will be achieved by the establishment of a new station either at Pangani Falls or upstream from Hale in a cascade system. The case of the Pangani clearly demonstrates the importance of a long-term plan for the development of a river basin.

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TWO NEW PROCESSING INDUSTRIES AT DAR ES SALAAM

The significance of the establishment of two new processing industries at Dar es Salaam is two-fold: it is the first time in Tanzania's history that significant quantities of two important primary commodities, sisal and cashew, are retained for industrial processes; and, because of the limited local demand for the products, the industries will not merely displace imports but also develop a remunerative export trade.

Four principal locational factors are involved in the siting of these industries at Dar es Salaam: firstly, the availability of hydro-electric power, cheaper than thermal power because of exemption from fuel surcharge, from the Hale-Pangani system, together with the probability of the installation of another hydro-electric plant on the lower Pangani by 1968 while the diesel-powered plant in the city could be temporarily used to augment generation; secondly, the convergence of lines of communications on the capital which facilitates the conveyance of bulky agricultural raw materials; thirdly, the advantage of access to a major port for export-oriented industries; and finally, the availability of a large labour force and planned industrial sites equipped with basic facilities.

The development of a vertical pattern of economic relationships with the metropolitan countries prior to independence produced an ironical situation whereby a major exporter of sisal fibre was obliged to import sisal products. It is to eliminate such anomalies and to diversify the country's exports that processing industries are on the priority list under the Five Year Development Plan. The first sisal-spinning factory, set up by Craven and Speeding (Tanzania) Ltd., a subsidiary of British Ropes, was opened in November 1964 and the second, set up by the Tanzania Sisal-Spinning Company, a subsidiary jointly of United Rope Works of Holland and Baumhütters of West Germany, is scheduled to be opened