

Geothermal Energy: A Possible Source to Light Majimoto Community, Serengeti District, Tanzania

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ABSTRACT

Geothermal resources at Majimoto village in Serengeti District, Tanzania could be utilized in power generation to light the Majimoto Ward. The prospect is located approximately 63km from Musoma Municipal and is proximal to small scale gold mining site. The geothermal manifestation found in the area indicates the presence of a geothermal system that can be utilized for power generation and direct uses. However, more geological, geochemical and geophysical studies are required in order to confirm and quantify the resource. To confirm and build up confidence on the availability of the resource, exploratory wells will have to be drilled. The Majimoto geothermal area is derived from a depression in Archean rocks. The current surface temperature is about 50°C and the area with hot springs is bounded by hills. Hot springs produce a large amount of helium which is about 13% of the total gas volume, and some little CO₂ gas.

1.0 INTRODUCTION

The Majimoto community is located in Serengeti District, Mara region, Tanzania (Figure 1) and situated in the greenstone belt near Lake Victoria. The area also hosts gold and small scale mining is currently on-going. The local community engages in agriculture with livestock keeping as its main activity. The power connection in Tanzania stands at about 939,229 customers as of February 2012, which represents about 18.4% of the country's population with access to electricity. However, only 6.6% of the rural population in the country has access to electricity. This is a small percentage considering the rural population which stands at more than 70%. The 2012/2013 target is to connect 250,000 customers in the country.

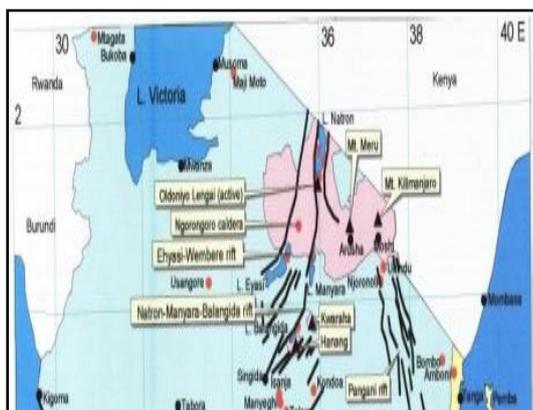


Figure 1: Map showing location of Majimoto geothermal field

The population of Majimoto community is linked to the Iramba and Sirorisimba villages via a gravel road. Development of geothermal resource at Majimoto will therefore be beneficial to the three villages - and the nation at large - by increasing energy security.

2.0 GEOTHERMAL MANIFESTATIONS

At Majimoto village, geothermal manifestations observed at the site include hot springs, mud pools and geothermal grass (Figure 2). Currently, the surface temperature of the water from the hot springs is about 50°C and the water flows through a valley northwards sandwiched between hills.



Figure 2: Photos showing geothermal manifestation at Majimoto area

3.0 PREVIOUS STUDIES AND HISTORY OF GEOTHERMAL WATERS IN MAJIMOTO AREA

3.1 Previous Works

Geothermal related surveys in the Majimoto area were first carried out by A. Walker in 1969 who measured the temperature and the flow rate. In 1978, SWECO undertook a study and both came up with the same results on surface temperature and flow rate. The findings indicated surface temperature of 50°C and flow rate of 2 l/s. According to Hochstein et al., 2000, Majimoto springs discharge from a depression in Archean rocks and discharge a large amount of helium (c. 13% of the volume) with little CO₂.

3.2 History of Direct Use of Geothermal Water at Majimoto

Historically, the name Majimoto means hot water. The village was therefore named as such due to the hot springs around the area and is the one of the well-known communities in the country which has been utilizing the geothermal hot water for many decades. People of this community have been using the water for bathing to cure rashes, washing, baptismal and feeding livestock on magadi soda.

3.3 Source of Energy for Majimoto Community

The community has been utilizing biomass based energy, solar and fossil fuels such as kerosene, though, biomass based energy (firewood) is used as the primary source of energy. Mugumu Town in Serengeti District is electrified through the main grid. The available renewable energy potential sources are biomass, solar and geothermal energy.

4.0 BRIEF GEOLOGICAL SETTING OF THE AREA

The Majimoto springs discharge from a depression in Achaean rocks. The hot springs could be related to faults that are associated with the Western branch of the Great East African Rift System (GEARS) shown in Figure 3. Further, faulting could be linked to the Gulf of Speke from Lake Victoria (Lake Victoria-Majimoto-Western branch of GEARS).



Figure 3: Map showing location of Majimoto geothermal area and Gulf of Speke.

5.0 EXPLOITING GEOTHERMAL RESOURCE AS A POSSIBLE SOURCE OF POWER

Majimoto geothermal resource is a possible source of energy to electrify Majimoto community and its neighbours - the Iramba and Sirorisimba communities. Geothermal energy is clean, reliable, affordable and environmental friendly. The resource can be utilized in a sustainable manner to foster sustainable development and environment for today's and future generations. Majimoto geothermal resource can be exploited through the phases of development, which includes detailed surface exploration, exploration drilling, appraisal drilling, production drilling, plant construction and power plant operation. Principally, the power generated from Majimoto geothermal areas will be expected to:

- Light Majimoto and the neighboring communities;
- Improve education and health sectors in Majimoto Division;
- Accelerate the agricultural sector in line with *Kilimo Kwanza*;
- Facilitate the development of the tourism sector and hotel industry;

- Increase employment to locals during exploration and operation activities; and
- Feed the main grid and therefore increase the number of people with access to electricity.

6.0 GOVERNMENT INITIATIVE IN PROMOTING RENEWABLE ENERGY TECHNOLOGIES

The Power market in Tanzania is set to increase and the clean and mixed sources of electricity have been encouraged as stated in the Energy Policy, 2003. The Energy Policy, 2003 reinforces the need for reliable and affordable energy supplies and their use in a rational and sustainable manner in support of national development goals. The Government of Tanzania through the Ministry of Energy and Minerals established Rural Energy Agency (REA) and Rural Energy Fund (REF) with the aim of electrifying the rural areas. Through these a project can acquire a grant after approval by the Rural Energy Agency (REA) and the power generated can be sold to the main grid or as off grid. Therefore, energy projects that are dedicated to light rural community can use the opportunity. This brings on-board private investors to develop the resource.

Power Purchase Agreements (PPAs) are negotiated if the power generated is above 10 MW and if the electricity is to be sold to National Utility Company, Tanzania Electric Supply Company (TANESCO). For power generation of up to 10 MW but not less than 100 kW, negotiation can be done through Standardized Small Power Purchase Agreement (SSPPA). In addition, for Small Power Projects of up to 10 MW the tariffs are calculated through Standardized Small Power Purchase Tariff Methodology and the tariffs are adjusted on an annual basis to reflect changes in the Consumers Price Index.

7.0 CONCLUSION

1. Majimoto geothermal resource is a possible source of energy to light the community.
2. Poverty will be reduced through people engaging in business after power is connected
3. Detailed surface exploration to drilling is needed to exploit the resource.

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