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Geothermal Status in Burundi

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ABSTRACT

Many surveys have been carried out regarding the geothermal locations and characterizations between 1969 to 2013. These studies addressing status of the nature of geothermal resources in the Great Lakes region: Burundi, Democratic Republic of Congo and Rwanda with a long-term goal aiming at the use of the resources either for electricity generation or for other uses.

These investigations have divided the geothermal areas of Burundi into three categories: (1) Surface temperature of 30 - 40°C (away from the rift), (2) Surface temperature around 48°C in the middle of the Rift Valley and (3) surface temperatures around 68°C in the northern part of the Rift Valley. These studies are not delineating the subsurface temperatures of the geothermal systems. All these temperatures are low and do not feet for the electricity generation. The assessment of the temperature gradient is required to confirm the temperature of the reservoir at depth for the feasibility studies.

However, the major disadvantage of geothermal energy is that it requires expensive cost relevant to explorations studies. Before to get these funds, the municipalities of some geothermal resources areas with low temperatures have build the spas balneology, bathing and tourism place where many people visit and increase the economy of those municipalities.

1. INTRODUCTION

The Government of Burundi has just put in place the National Development Plan 2018-2027, which is based on five strategic orientations: (1) Develop growth-enhancing sectors for the structural transformation of the economy; (2) Human capital; (3) governance, security and safeguarding national sovereignty; (4) Environment, climate change and spatial planning and (5) Mobilization of innovative resources.

In the process of implementation of the National Development Plan 2018-2027, a program of priority actions has been defined, which aims to achieve five strategic objectives in the energy sector to improve the supply and access to energy, namely (i) develop hydropower, solar, peat, municipal waste and geothermal resources; (ii) improve the biomass sector (wood energy, charcoal, peat, municipal waste) while safeguarding the environment; (iii) promote renewable and alternative energies; (iv) improve the governance of the energy sector and (v) ensure the security of the petroleum product supply chain.

The Government of Burundi is aware of the geothermal potential existing in the region and that more and more East African States are turning to this new source of energy supported by international partners in a number of initiatives and commitments taken in the regional and global level.

Indeed, Burundi is located on the extensions of the Rift Valley of geologically active East Africa. The geothermal prospects are therefore favorable. However, the major disadvantage of geothermal energy is that it requires very expensive explorations at the feasibility studies stage.

A first geothermal resource reconnaissance study was conducted in 1982 at the request of the Government of Burundi to the Government of Iceland to estimate the use of geothermal resources. The study was conducted by the Icelandic National Energy Agency and 14 areas of geothermal resource location were visited. Since then, no other activity has followed until 2012. It was not until mid-2012 that a new study of recognition at Ruhwa sites in Cibitoke and Mugara Province in Rumonge Province was carried out by an Icelandic firm ISOR under the financing of ICEIDA. In 2013, a surface study on the Ruhwa site was carried out and the related report was validated in January 2015, under the financing of the European Development Fund under the Agreements between the Union European and EGL for the Great Lakes Regional Project.

2. GEOLOGY BACKGROUND

Please be very careful to use styles throughout the document, so that all the papers will have a similar appearance. This is <Normal The East Africa Rift System (EARS) is an active intra-continental rift system, comprising an axial rift. The EARS is a unique succession of tectonic basins (rift valleys, grabens) linked by intra-continental transforms and segmented by transfer zones and accommodation zones (Chrorowicz, 2005).

On the surface, the main tectonic features are normal faults but there are also strike-slip faults, oblique-slipe faults and reverse faults. The rift system may be divided into two main branches, i.e. the eastern branch and the western branch. The western branch runs over a distance of 2,100 km, from Lake Albert in the north to Lake Malawi in the south.

Burundian bedrock is mostly composed of Precambrian formations and complexes. Dominant rock types are quartzite, gneiss, granite, dolomite, schist, sandstones and conglomerate. The Rusizi valley is filled with thick sequences of alluvium formed during the Holocene. Sedments from Pleistocene, mostly lithified sandstone and conglomerates, are characteristic of the area east of the Rusizi

valley, overlying Precambrian formation. A strip of Tertiary tholeiitic and alkali lavas is found in NW Burundi (Covering some 30 km2) originating from the volcanic zone of Sud-Kivu in Rwanda.

The hot spring within the rift valley emerges from sediments with the exception of the springs at Mugara where the water rises from Precambrian quartzites. Hot springs located outside the Rift Valley all emerge from Precambrian rocks. The hot springs in NW Burundi, e.g Ruhwa, Ruhanga and Cibitoke do not seem to be directly associated with the Cenozoic basalts found in that area but several researches have inferred that underplating of magma might be an important process beneath the Tanganyika Rift (e.g. Kampunzu et al. 1998, fig. 1)

Figure 1: Geothermal sites in Burundi (Friorickson et al. 2012).

3. GEOTHERMAL RESOURCES AND POTENTIAL

Deestra and al. (1969) and other local unpublished authors have made inventory and description of principal hot springs in Burundi. They confirmed available data and pointed out geothermal events along African Great Rift in a particular geo-structural context, with geochemical consideration.

These historical studies (1969 to 1982) covered in Burundi eight geothermal locations. A description of 15 hot springs, 14 geothermal locations and chemical analysis from 13 of them has been reported. The surrounding's geology was described and the geological analysis of the discharges has been recommended.

In the Rusizi rift valley, the source temperature rising through the porous sediments (Ruhwa spring record 68°C at surface). Quartz geo-thermometer application suggests underground source temperature around 110-120°C (Fridriksson et al. 2012). He notes that all discharges arising from sediments were carbon dioxide rich, indicating the presence of a powerful heat source.

In summary an exploitable geothermal source whose temperature lies in the range of 100-160°C, may exist in the Rusizi valley and probably extend well into DRC and Rwanda. This source is thought to be connected to the volcanic area south of Lake Kivu. Therefore, an anomalously geothermal gradient may be expected in this region (Nizeye, 2012).

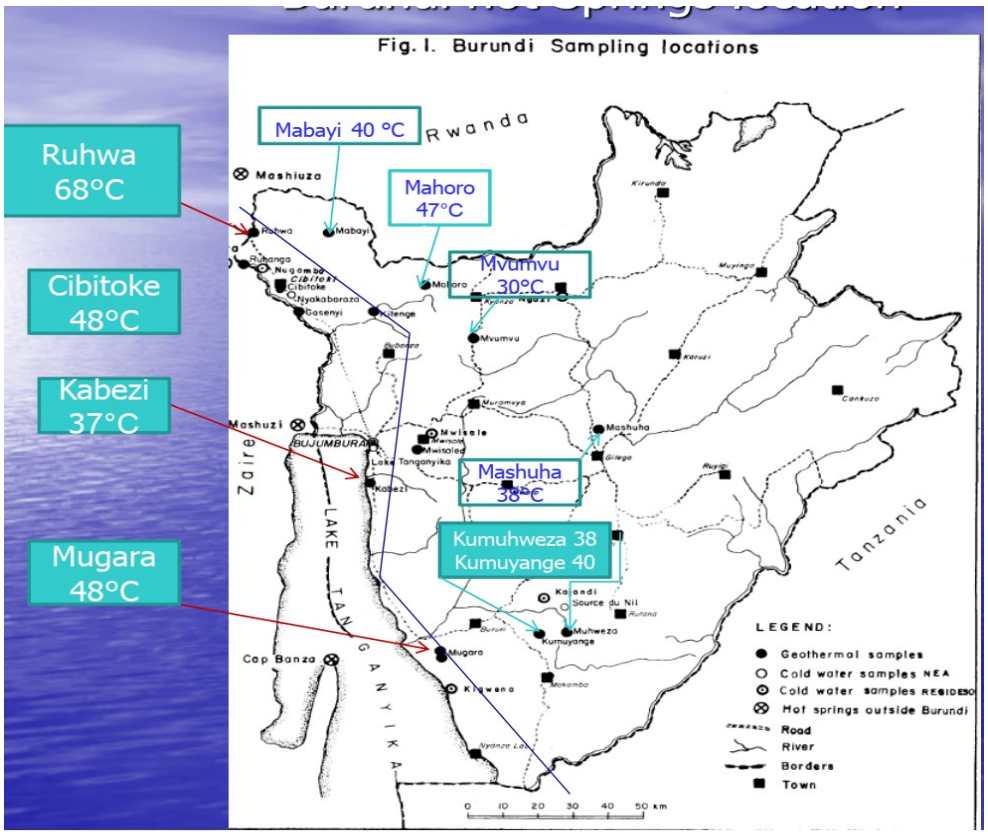

Figure 2: Geothermal sites and Temperature in Burundi (NDIZEYE, 2012).

4. GEOTHERMAL UTILIZATION

Burundi doesn't have electricity production from geothermal resource. The major electricity productions are from hydropower, Fossil Fuels and solar energy with respectively 50 Mw for hydro, 35.5Mw for fossil and 2.9MW of solar energy. The total production capacities of Country are 88.4MW. Many households in rural area use solar package, but are not currently counted. Five national and one regional projects of hydropower are under construction with capacity of 121.5MW and one power plant of solar energy with 7.5MW. The total capacities of the power plant under construction are 129MW. However, almost these projects can be operating in 2020. The electricity production from geothermal resources requires many studies and expensive in the first steps of explorations and drilling. Before to get these funds, the Rumonge municipality has developped this geothermal resource with low temperatures to increase treasure and people revenue.

About direct geothermal utilisation, the Rumonge Commune has built the spas balneology and bathing place in one site among geothermal resource of the municipality called Mugara. Many people from different location of Country visit the area for bathing and tourism in this place. With the development of tourism in this place, others economics activities have been created, such the hotels are constructed around the geothermal resource and small market has been developed. The agency of transport for all people and tourism who wish to visit this area, including the services needed. With the frequentation of the tourism in the area, the commune enters its treasure more than one million per week. The size of these spas balneology and bathing are 13x 6 meters and constructed at 35555, 56 US$ of investment by the Government with 69% and the rest by Commune.

Burundi has a policy and its sector strategies adopted in 2011 for to accelerate its progress towards emergence. The Policy Letter is the reference for economic and social policy in the medium and long term. Actually, the sector strategy is being updated for being in conformity with the National Development Plan 2018-2027, the objective 7 of Sustainable Development Goal and the strategic orientations of the policies of the East African Community (EAC).

About lows and Regulatory Framework of the Energy Sector, two texts of laws exist. It is:

- Law No. 1/014 of 27 April 2015 on the Public-Private Partnership Contracts Scheme in Burundi, and its implementing text, including Decree No. 100/31 of 24 February 2017 laying down procedures applicable in the awarding of Contracts Public-Private Partnership;

- Law n ° 1/013 of April 23, 2015 on the Reorganization of the Electricity Sector as well as its texts of application, among others:

Decree No. 100/131 of 23 June 2016 reorganizing the transport, distribution and marketing of electricity,

Decree No. 100/131 of 23 June 2016 on the production, import and export of electricity and;

Decree No. 100/132 of 23 June 2016 on the procedure for the development of a production plant for exclusive and commercial use.

However, there is no law and specific application texts for the organization of the Renewable Energies and Modern Fuels sector. The absence of this Law and its implementing texts constitutes an obstacle for the promotion of Renewable Energies and Modern Fuels. The existence of this Law and its implementing texts, with its corollary of incentives, will support the development of these Energies.

CONCLUSIONS

Geothermal energy is not yet used in Burundi for electricity production. The major electricity used is from in hydropower. However, one place of geothermal site is used by people for balneology and bathing. The current level of utilization of geothermal energy represents only a very small fraction of the identified geothermal resources and is not counted and now. However, the municipalities in which the geothermal resources are located start to raise awareness of the importance in the development of the area and improving the sanitation around. This increase is almost exclusively the market and the revenue of Commune. In order to attract more advantage of these resources which are located in many areas, it's important for government to mobilize funds for geothermal exploration and development of a power plant if the possibility is proved.

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