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Geothermal Energy and How It Has Powered Kenya

Geothermal power is renewable and cost-effective source of energy. It utilizes geothermal steam to generate power. In Kenya the country has invested largely reaching a capacity of about 690 MW by 2019. The generation of electricity in the country is managed by the Kenya Electricity Generating Company (KenGen) which is a parastatal with 74% of its shares owned by the government. Geothermal energy is preferred to other energy sources because it is not affected by changes in climate and it is cost-effective among other reasons. The country has built several geothermal power plants despite challenges in developing them; geothermal power has impacted the environment and the socio-economic lives of its people.

Production of Geothermal Power in Kenya

The country has built several geothermal power stations. There are six geothermal power stations either fully operational, with on-going construction or planned for construction. The Olkaria geothermal power plants are constructed along the Rift Valley in Nakuru County. The power plants in operation are Olkaria I, Olkaria II, Olkaria III and Olkaria IV while construction of Olkaria V is going on and that of Olkaria VI is scheduled to start in 2021 ("Renewable - Geothermal", 2012). The government has facilitated the building of plants for generating geothermal energy through Olkaria I which produces 195 MW while Olkaria II generates 105 MW. In addition, Olkaria III is a privately owned geothermal power plant which generates 139 MW; Olkaria IV generates 150 MW (Ritcher 2018). In addition, there are other power plants either under construction, planned for or recently commissioned. They include Eburru geothermal that can produce 2.5 MW. The country needs to invest more in geothermal energy to maximize on its available natural resources for generating geothermal energy.

Geothermal power capacity of Kenya has not been fully utilized.The Rift Valley has a potential to produce 7 000 MW to 10 000 MW from geothermal power stations. There have been explorations facilitated by the Geothermal Development Company (GDC) in Longonot, Suswa, Menengai, Lake Magadi and Lake Bogoria among other areas to determine the suitable places to build more geothermal power plants (Ritcher 2018).The country plans to achieve more than 5 000 MW, about 26% of total energy by 2030 (Ritcher 2018).. Achieving this level of electricity output from geothermal stations will make it the major source of clean and renewable energy. Achieving Vision 2030 and NCCAP among other national initiatives requires a renewable energy source like geothermal power that is reliable, environmentally friendly and cost-effective. The need to diversify to other energy sources like geothermal power is as a result of climate changes making hydroelectric power generation in Kenya unreliable.

Challenges in Development of Geothermal Power Plants in Kenya

Developing power stations faces financial challenges, opposition from environmental activists and negative political influence. Investors will face financial strains due to high costs of explorations and infrastructures for use in building the geothermal plants. The cost of explorations is high for the Kenyan government with a strained budget or private investors who intend to make profits. During explorations drilling one well for geothermal power generation requires more than one million USD (Johnson & Ogeya, 2018). GDC was established by the Kenyan government to facilitate explorations of geothermal fields. After proving the suitability of a field for geothermal power production, the cost of infrastructure required is also high. The cost of drilling wells, acquiring systems for gathering steam and the associated technology to produce 20 MW was estimated at about US 90 million. Despite the high cost of exploration and installation of infrastructures, geothermal plants provide cheap and clean energy thus the need to provide the required financial to maximize on the benefits.

Environmentalists also pose a challenge to development of geothermal power plants in Kenya. Geothermal plants threaten the environment if chemicals from the steam are not handled properly, if natural habits are disrupted leading to environmental degradation and also if water withdraws from rivers and lakes in surroundings (Johnson & Ogeya, 2018). The negative effects the process has on environment may affect people depriving them of land and sufficient water resources. There is need to ensure proper assessment of project impact on the environment and also proposing mitigation measures to curb the risks (Ngugi 2012). The use of system of steam piping that is friendly to wildlife and controlling withdrawal of water from reservoirs through reinjection are examples of measures that can be taken. Geothermal power can positively impact the Kenyan economy, therefore the challenges arising from environmental concerns should be resolved with the most effective measures.

Institutional and political differences may occur between KenGen and KPLC. KenGen majors in the generating electricity which it sells to Kenya Power and Lighting Company (KPLC) for it to supply to the final consumers ("Renewable - Geothermal", 2012). If KPLC purchases electricity which is not fully consumed in the country due to slow growth in the economy, debt may accrue on the company. The participation of county governments has also raised concerns thus the need to implement policies that prevent accumulation of debts and outline duties of both the local and central government in generation of geothermal power.

Socio-economic Impact of Geothermal Power Generation in Kenya

Relocation of people and the growth of the economy signifies ways in which geothermal power has impacted the lives of Kenyans. The government faced opposition through protests from people who had to be relocated from their land for use in building geothermal plants. The government ensures proper compensation of people who are relocated, provision of social benefits to the host community and availing job opportunities among other things (Mariita 2002). Despite opposition from the communities, geothermal power generation is pursued due to its economic benefits. GDC has sought support from New Zealand government on how to manage issues raised by the communities about land and development of geothermal infrastructures ("Renewable - Geothermal", 2012). However, the complexity in how the geothermal projects are financed poses a challenge on how the project is managed and issues from the community are dealt with (Mariita

2002). Geothermal plants have provide cheap and reliable power in the country facilitating industrial growth and economic development in general. The negative social impact should be resolved through proper compensation among other measures to achieve the desired level of economic growth facilitated by cheap geothermal energy.

In conclusion, the economy of Kenya largely relies on geothermal energy and other power sources. Geothermal power provides cheap and reliable energy hence the government has invested more in it; the target of over 5 000 MW can be reached and the source is reliable since it is not affected by climate changes. There are operational power plants in Olkaria among other areas while some are under construction. Kenya focuses on geothermal development and aims at achieving over 5 000MW by 2030 and making it the largest source of clean energy. The development of geothermal plants has impacted the social and economic lives of people. Relocation of people mostly faces opposition from the community thus the need to ensure fair compensation before relocating them. The provision of cheap and reliable energy from geothermal plants has promoted economic growth in the country. GDC helps in exploration and development of geothermal plants by reducing financial and other risks that may be faced. Governments and private institutions should implement effective measures to reduce the negative effects on environment and ensure fair compensation of people when relocating them to build geothermal power plants.

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