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Geothermal Financing Options

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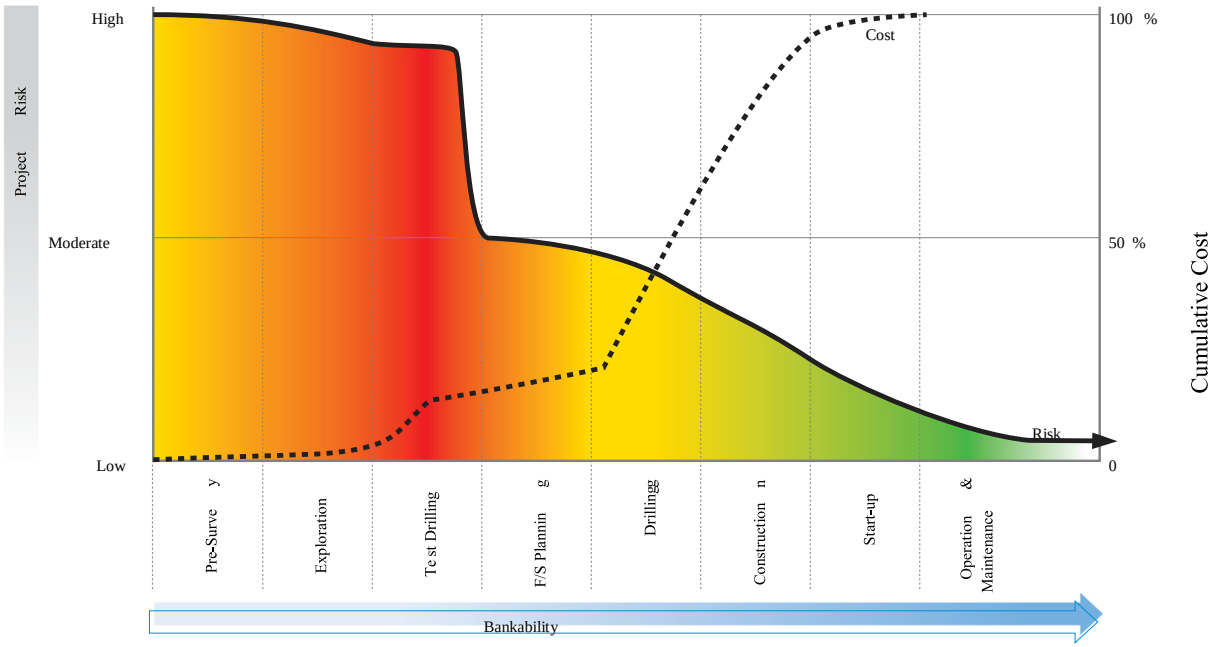
ABSTRACT

Geothermal development is a capital intensive endeavor. The development of geothermal within Kenya begun in 1956 with slow growth but later accelerated from 2007. The growth was spurred after the injection of funds from United Nations Development Programme (UNDP), resulting in the commissioning of the first geothermal plant in Kenya in 1981. After realization of benefits of geothermal, the Kenyan government was keen to invest. This saw resulted to negotiations499 for concessional loans and access cheap funding from various institutions. Recently geothermal companies are able to finance geothermal projects through different packaging means such as loans and grants, public private partnerships, private investments and contract packaging. These options are also specific to the different phases of geothermal development such as exploration, drilling and power plant development phase. The financing options are also based on the adverse risks that are inherent with the development of geothermal This paper will seek to discuss the available options for financing geothermal projects in various stages of development, with focus on development of geothermal within the African Rift, using geothermal development in Olkaria as a case study.

INTRODUCTION

Geothermal development is a capital intensive endeavor coupled with high risk. Investment costs per installed megawatt vary, from US$ 2.8 million to US$ 5.5 million per MW for a 50 MW plant, depending on geology, quality of the resource; temperature, flow rate, chemistry, and the infrastructure in place (Energy Sector Management Assistance Programme -ESMAP). This figure is inclusive of initial studies to development of a power plant. It is noted (ESMAP) that the key elements of successful geothermal development is availability of sufficiently accurate geothermal resource data , effective and dedicated institutions; supportive policies and regulations and access to suitable financing .. Three of these key elements that is institutions, policies and financing directly influenced by the government. In the Kenyan case the government operationalized Geothermal Development Company (GDC) in 2008 with the mandate of resource assessment. Policies such as the Geothermal Act have been enacted to guide in resource development and exploitation. Financing however still remains a paramount issue with regard to the risks involved in development of the resource. Figure 1: Project Cost and Risk Profile (*ESMAP Technical Report 002/12*) shows the risks vis a vis the cost of development.



Source | ESMAP Technical Report 002/12.

Geothermal prospects in Kenya are dominant along the Rift Valley with most development being in the Olkaria field. Geothermal exploration in the country commenced in 1956 with two wells being drilled in 1970s through the funding from UNDP. Further drilling and studies were conducted in the field and within the Rift Valley including conducting reconnaissance studies in Menengai, lake Bogoria and Baringo identifying areas of both high and low enthalpy systems. Six more wells were drilled leading to commissioning of the first 15 MWe Olkaria I Unit I in 1981. With time the Kenyan government restructured the energy sector in bid to improve efficiency in the usage of resources earmarked for generation, transmission and distribution of electricity in the country. Kenya

Electricity Generating Company Ltd (KenGen) was incorporated in 1998 and charged with resource exploitation within the country for electricity generation including development of geothermal resources.

Currently 633MWe of geothermal is transmitted to the grid ensuring electrical stability within the country. The development is majorly within the Olkaria region with the total capacity at 633 MWe. Out 533 Mwe developed through a government parastatal Kenya Electricity Generating Company and. through Or power. Further development is ongoing in Menengai, silali and Paka

Table 1: Current Geothermal Capacity (Source LCPD)

Plant	Installed Capacity (MW)	Company
Olkaria I	45	KenGen
Olkaria II	105	
Eburru	2.5	
Wellheads	80.6	
Olkaria IV	140	
Olkaria I AU	140	
Or Power 4 (I,II,III)	110	Or Power
Or Power 4 (IV)	29	
Total	652.1	

FINANCIAL INSTRUMENTS •

Geothermal resources in Kenya are located within the Rift Valley with an estimated potential of between 7,000 MW to 10,000 MW spread over 14 prospective sites. According to the LCPD it is expected that growth in the sector will be approximately 26% with installed capacity rising to 1,868 MWE by 2030. This project pipeline is envisaged through the extensive exploitation of the resource both by government affiliated entities and incoming IPPs. The development of geothermal in Kenya has in the past been through financing from grants and DFIs. The development between 1950 and 2003 that is of Olkaria I (45MWe and Olkaria II (105MWe) was majorly through the World Bank. Financing of these projects was through grants and loans with the guarantee form the government and direct financing in technology and knowledge transfer. Multi-financing options also through government guarantee has been used such as in the case of the Olkaria I Additional unit and Olkaria IV with financiers including International Development Association (IDA), KfW , European Investment Bank (EIB), Japan International Cooperation Agency (JICA),French Development Agency (AfD and the government. The investment portfolio of these projects are predominantly as stated Government guaranteed loans and government on-lent loans which accounts for the highest percentage with direct borrowing also being a form of raising capital. According to analysis Figure 2 commercial banks have the most expensive recourse of financing and government accounts for the least expensive especially for geothermal development and most renewable energy technology development.

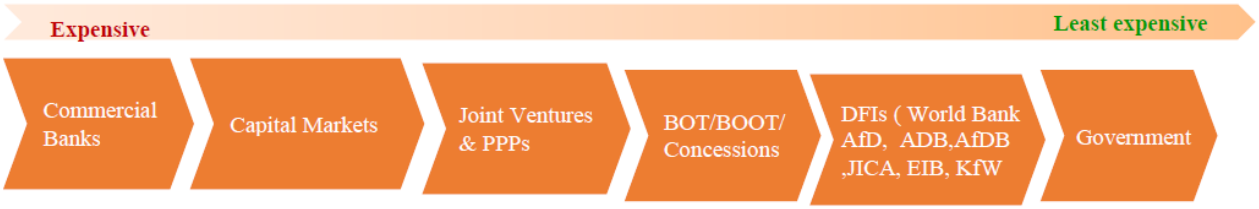


Figure 2: Financing Options

Concessional finance or grants are defined as loans that are extended on less stringent terms as the markets, these loans attract low interest rates and long repayment period. The IDA an arm of the World Bank, established in 1960, provides grants and low to zero-interest loans for projects and programs that boost economic growth, reduce poverty, and improve poor people's lives. This means that IDA credits have a zero or very low interest charge and repayments are stretched over 30 to 38 years, including a 5- to 10-year grace period. IDA also provides grants to countries at risk of debt distress. Currently, Kenya has received IDA guarantee of 180$ Million for refinancing KenGen's Portfolio. Through this financing model the burden of public financing is alleviated through revenue earned from the sale of electricity and grants if available. The main providers of public finance for renewable energy are mainly donor governments and their agencies, climate funds and development finance institutions. Development Finance Institutions (DFIs) (national, multilateral and bilateral aid).

ESMAP technical report identifies eight different models of geothermal power development. One model being a scenario where a single national entity implements the full sequence of phases of a geothermal power project. In this model government finances the development through grants and loans. The government bears the risks development entirely with revenues from sale of electricity being the only recourse to alleviate the burden on public finances. This model is best in areas where geothermal is not explored, as was in the case in the 1970s to 90s in Kenya. As stated earlier the course of geothermal development is a high risk especially during the initial phases of development from survey to exploratory drilling with the risk being averted as drilling continues. Due to this it is common that most governments with keen interest in geothermal development eventually take up the initial investment this has been seen in other countries including, Ethiopia, Djibouti and Tanzania. In tandem with this the government of Kenya set up the Geothermal Development Company (GDC) a special Purpose vehicle (SPV) in 2008 to undertake integrated development of geothermal power through initial exploration, drilling, resource assessments and the promotion of direct utilization of geothermal resources. The company being 100% government owned and funded was to absorb the risks adherent to the initial development therefore opening up opportunities for both public and private participation.

Geothermal development in the developing states can also benefit from capital set up by the multilateral and bilateral development banks in form of special purpose funds that are being set up the Clean Technology Fund and the Scaling-up Renewable Energy Program (SREP), this create unique opportunities for leveraging capital from various other sources to support low carbon investments. Efforts towards development concessional financing to mitigate geothermal resource risk has borne programs such as the Europe and Central Asia (ECA) GeoFund and Africna Rift Geothermal Facility (ArGeo) and Geothermal Risk Mitigation Funf (GRMF) these have been initiated under the auspice of the World Bank.

Currently, there is need to include the private sector in the development of geothermal this will result to competitive financing in the sector which currently lagging with major investment especially in private investment being directed to other forms of renewable energy especially solar and wind. Geothermal investment according to (ren21) fell globally by 9% in 2018 Interest in investment as earlier stated being hampered by high cost and project risk due to prolonged lead time, resource and exploration risk and high development costs.

One of the instrument s that has not previously been considered is the use of grants in return for shareholding in a company. This forms an option of capital contribution for the grant. However this leads to the risk of increasing the shareholding of either the public agency into the company shareholding compared to private development. Under this funding, the government can provide capital grants for a share of project costs, where the project would otherwise not be viable due to the constraints on user fees that can be charged. However, for a public listed company the government as in the case of KenGen in 2016 converted the on-lent loans into the company's equity during a rights issues offer.

Venture Capital financing in the case of a regulated market may seem quite battle to get into however in small companies willing to invest in already explored areas could benefit. Venture capital financing is generally targeted at new technologies and companies with a high growth potential. Returns from this could be through an initial public offering (IPO) on the stock market or sale to a larger company. This can be in the form of already drilled wells that are likely not to be utilized in conventional plants. Wells with lower pressure than acceptable in conversional plants. Venture capital can take the form of a Build Operate Transfer or Build Own Operate Transfer type of a project with fixed concessional terms. This would ease the risks associated with studies and drilling and the long gestation period to have a power plant. The contractor would however be leasing the steam and wellhead equipment through agreed terms of contract. Private equity such as through pension funds and schemes could also be target for geothermal financing in Independent Power Producers (IPPs) and companies seeking diversification of income from their normal activities. Companies looking at setting up within industrial parks such as one being developed in Olkaria could diversify into sale of steam and brine for factory use. The company would be in a lease agreement for steam and have a third party off taker. In the case of IPPs this would be a direct sale agreement within parties with investments from private equity. However, the energy market requires to be liberalized to ensure that policies and regulations allow and a strong financial market with ease of exit.

Public Private Partnerships are also encouraged this involves the collaboration of a government entity and a private-sector company to finance, build and operate projects. Kenya is keen on ensuring that Public Private Partnership (PPP) is functional with government issuing a PPP policy in December 2011. Currently PPP projects are under way in the Menengai Geothermal. From 2011 through 2018, the African Development Bank (Fad) supported the initial phase of GDC's Menengai through financial contributions from AfDB and the Climate Investment Funds (CIF). The resource risks associated with exploration and field development, was absorbed by GDC while the private entities invest in putting up the geothermal plants. Similarly, KenGen is geared towards financing Olkaria VI through PPP. PPPs have been used in El Salvador, Japan, Turkey, and Indonesia,

The government of Kenya has previously offered infrastructure bonds that are generally used to finance projects. This method of financing commonly through asset financing or securitization is preferred for major projects securization is transforming illiquid assets (such as the cash flows from power purchase agreement) tradable instruments that is securities with proceeds used to refinance projects. This is similar to issuance of bonds where investors lend while interest is payable to the lender. This form of investment is however backed by cash flows generated by the projects. Asset backed financing has advantages including Longer tenor and possibly lower cost than bank financing, and potentially led to bundling projects and in a single security . However, this requires strong financial markets.

Updated Least Cost Power development plan Study Plan: 2017-2037, June 2018

Geothermal Handbook: Planning and Financing Power Generation. Technical Report 002/12