Proceedings, 7th African Rift Geothermal Conference
Kigali, Rwanda 31st October – 2nd November 2018

Policies for Accelerating the Scaling Up of Geothermal Industry in Great Rift African Countries

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ABSTRACT

The scaling-up of geothermal industry in African Rift countries has been slow and challenging compared to other renewable energy sources like solar and mini hydro. This is despite the fact that geothermal development in the African Rift countries started as far back as the 1950's. This can be attributed to many factors including the lack of or insufficient policies specific to geothermal energy and investment support.

Investment support from governments in the form of tax exemptions for equipment and also corporate tax waivers for a specified period are essential for scaling-up geothermal development. This is due to the fact that the risk is high in the early stages of exploration. Investment support also lowers the barriers to market entry for investors compared to an environment without the support.

Policies such as Feed in Tariffs (FITs) also encourage the acceleration and scaling-up of geothermal development. FIT help to foster market stability and certainty for investors regarding the tariff they will be expecting to receive once they invest in the development of a geothermal power plant. Market stability is very important in reducing the risk premium that is expected to be paid to financiers. There is also facilitation of resource mobilisation when FITs are in place as more investments are directed at geothermal development once initial investors have already commenced power plant development. FITs are ideal for operational support of a geothermal project once it commences generation.

In the African Rift countries the implementation of policies such as investment support in the form of tax exemptions and operational support such as FITs will result in the increased number of players and increased investments in the development of geothermal resources. This will accelerate the scaling-up of geothermal industry in African Rift countries.

Keywords

Feed-in tariff, Investment support, Market entry, Market stability, Tax incentives

1. Introduction

The African Rift countries have yet to fully exploit their geothermal resources for both electricity production and direct use. Among the African Rift countries Kenya is the pioneer and leader in geothermal development for both electricity production and utilisation. At the end of 2017 it had an installed capacity of 657 MW from geothermal resources with plans for

further expansion (Mengi, 2017). From this a number of lessons can be learned from Kenya and other countries in the world on implementing programmes and policies for the scaling up of geothermal industry in African Rift countries.

A lot of experience has been acquired in the geothermal industry from around the world and based on past experience the geothermal industry has learned that the following characteristics must be considered for a project to be successful (Lund, 2011):

- Every project is unique
- Simplicity is the key to operational success
- A strong promoter ("hero") is needed to develop each project (person and/or company)
- Resource characteristics determine the use and success or failure of a project
- Customers/market are needed to be successful
- Funding and cost are important
- Land, institutional, and environmental considerations play an important role
- Qualified persons/companies are needed
- The public/government/local concerns/ acceptance must be considered
- Cascading can improve economics

The major barrier to the investment in greenhouse gas mitigating technologies and other renewable energies including geothermal is no the lack of capital, but rather the lack of appropriate policy packages to attract investments (Usher, 2008a). Most policies thus far have been unable to leverage the major drivers of investment decision process.

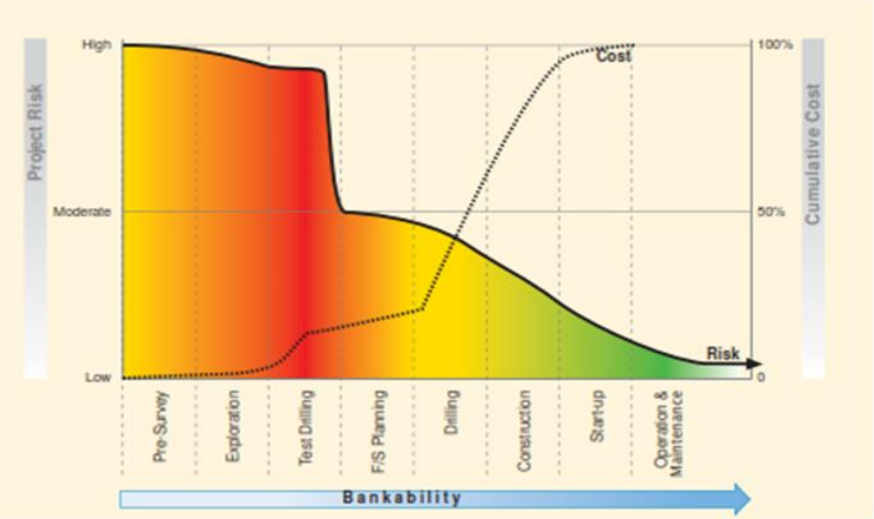
With the foregoing, a number programmes and policies can be formulated for the scaling up of geothermal industry in African Rift countries with the lessons from developed geothermal regions. This can accelerate the development of geothermal resources in African Rift countries without reinventing the wheel.

The development of geothermal resources takes time and there a many stages involved with varying risks and costs before a project can be fully developed and commissioned. The phases involved in geothermal power development where the cost and risk profile specific to geothermal power are shown in figure.1 A geothermal power project can be divided into a series of development phases before the actual operation and maintenance phase commences (Gehringer and Loksha, 2012):

- Preliminary survey;
- Exploration;
- Test drilling;
- Project review and planning;
- Field development and production drilling;
- Construction; and
- Start-up and commissioning.

For the scaling up of geothermal industry in the African Rift valley countries there have to be a range of various programmes and policies developed targeting the different phases of geothermal power development from preliminary surveys to start-up and commissioning of the geothermal projects. This will ensure the acceleration of geothermal power development as challenges of bottlenecks will be resolved and that different African Rift valley countries are at different stages of geothermal development.

Figure 1: Project cost and risk profile at various stages of development



Source: World Bank (2012)

There needs to be government support from the beginning of the development of geothermal resources from the beginning of the geothermal development phase from the fiscal aspect in the form of tax incentive to direct subsidies, loans and government guarantees to the legal aspect such as geothermal policy, investment protection and feed-in–tariff framework. There are also different development and financing models which can be adopted to fast track geothermal development such as Public Private Partnerships (PPP), Fully Public or Fully Private depending on the phase at which a geothermal development project is. All these programmes and policies create and enabling environment for the participation of both the public and private sector in the scaling up of geothermal industry in African Rift valley countries. A variety of policies consisting of specific technology-neutral measures provide one of the most enabling environment for the deployment of renewable energy technology deployment (Del Rio and Blade, 2012).

2. Fiscal Aspect

Energy produced from renewable sources such as solar, wind and geothermal tends to have a higher cost than energy produced from conventional sources for fossil and nuclear power plants which is lower. This can be explained through two main factors. Most of conventional power plants were not only built with significant subsidies, but also their capital costs have now been covered, which is not the case for renewable energy plants that have higher proportion for capital costs from the total plant cost (Abdmouleh et al 2015). This is further supported by the Climate Action Network Europe report of 2015 highlighting the substantial subsidies offered to the fossil industry as shown in the table.1 below.

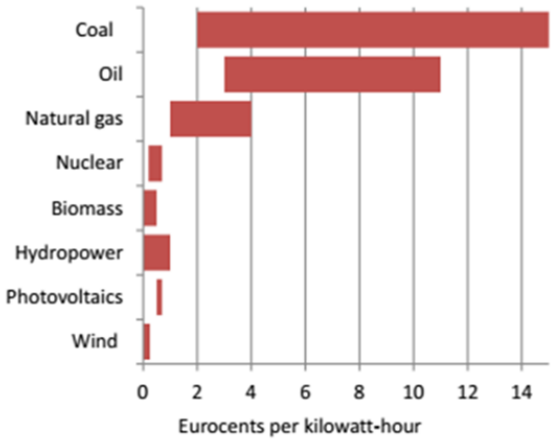
Table.1: Subsidies to the fossil fuel industry (Coal)

COUNTRY	GOVERNMENT SUPPORT	PERIOD
Germany	30 billion euros	1999-2011
Poland	16.8 billion euros	1990-2012
Spain	22 billion euros	1992-2014
France	1.2 billion euros	2011-2014
EU(Brussels)	144 million euros	2010-2014
Turkey	550 million euros	Annually

Source: CAN Europe, 2015

The second factor is that non internalised costs or externalities of producing electricity by burning fossil fuels are usually not included in the pricing of electricity produced from fossil fuels. This contributes to making electricity from fossil fuels to be cheaper than renewable energy sources. Renewable energies would be as competitive as fossil fuels if the externalities where to be in the electricity price (Owen, A. D, 2006).The externality cost is not fully factored in the price of electricity and this makes fossil fuels to have an advantage over renewable energy based on market price. Renewable energy like geothermal, wind and biomass can be more affordable than fossil fuels once externalities are fully included in the pricing of energy (Timmons, et al, 2014). The externalities from fossil fuels is the highest ranging from 2 to 15 (Euro cents per kilowatt-hour) shown in figure.2 which is an analysis of the externalities from various sources of electricity generation in the European Union.

Figure.2:Externality cost of various methods of electricity generation in Europe



Source:Owen,2006

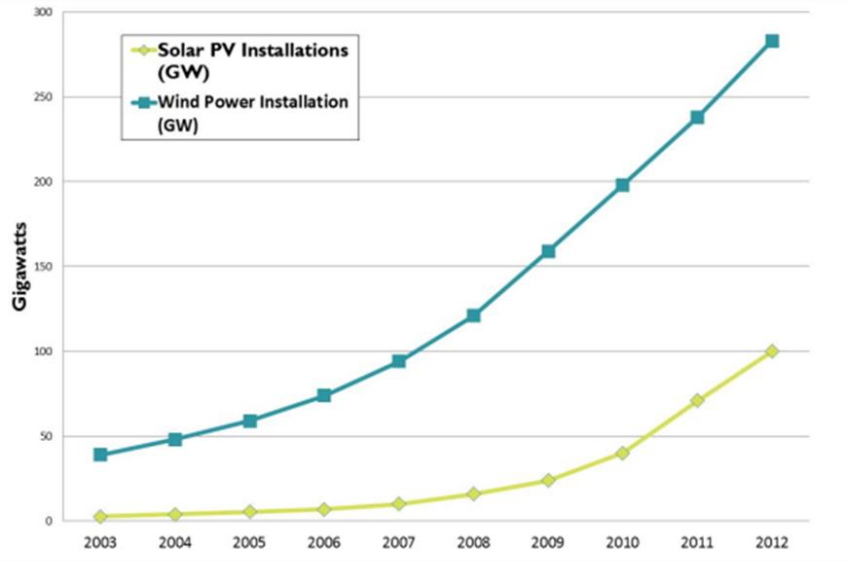
In the scaling up of the geothermal industry in African Rift valley countries it is important for governments to offer support to developers in terms of tax incentives, subsidies including direct funding especially in the early phases of geothermal development in order to accelerate the establishment of the geothermal industry.

2.1 Tax incentives

Tax incentives play a major role in reducing the geothermal cost of development for the private sector. The tax incentives can be applied at different phases of geothermal development. For instance in figure.1 when in the early stages of geothermal development the risk is very high in pre-survey, exploration and test drilling. Tax incentives can be applied to equipment used for exploration and this can reduce the cost of exploration for the developer. The costs further rise in the drilling phase where a drill rig will have to be hired or procured and other drilling accessories like drill bits and steel pipes will regularly be replaced raising. Tax incentive in the drilling phase case reduce the cost of drilling especially where import duties and other value added taxes applied for imported equipment and drilling accessories. When finally constructing and starting-up the power plant cost further accumulate according figure.1 and separate taxes are levied and this adds to the cost of development. With the application of tax incentives at different phases of geothermal development the cumulative cost of project development can be reduced for the developer as a way of promoting geothermal development.

Renewable energies like wind and solar photovoltaic have seen a substantial increase of deployment over the years. According to the U.S. Department of Energy (U.S.DOE) the global and U.S installed capacity for renewable energy such as solar photovoltaic has increased significantly due to technological improvements and government tax incentives (U.S.DOE 2012) and this is shown in figure.3.

Figure.3:The growth trend of wind and solar



Source: World Watch Institute (2014)

Tax incentives sometimes miss policy commitments as one of the major challenges. This is due to the fact that tax incentives depend on public budget. This is the major short coming of tax incentives and rebates (Berradale, 2010). Despite their shortcomings tax incentives can be applied in the early stages of promoting geothermal development as in the solar and wind in the US

2.2 Grants and subsidies

Grants and subsidies can be granted to the developers in the promotion of geothermal energy development. These provide short term fiscal relief for the deployment of renewable energy

technologies such as wind, solar and geothermal especially in the early stages of development (Olmos et al, 2012).Grants and subsidies also reduce investors' overall cost for renewable energy project development (Bergek et al 2012).They also act as a market incentive for the private sector. The main goal of subsidies is to create a favourable framework conditions for market entry. The subsidies can be phased out when the market for geothermal energy has been established (Gassner, 2010).

2.3 Government loans and guarantees

Government loans are of an interest to the private sector as the ability to refinance activities in the long term commitment to renewable energy (Bergek et al 2013).Geothermal development as with other renewable technologies such as wind and solar require long term commitment from both the government and private sector. Government guarantees offer an assurance to the private developers of the government's commitment to geothermal development and reduce uncertainty for the developers and financiers.

3. Legislation aspect

Given the nature of geothermal energy there needs to be clear policies and legislation. When to invest investors look for maximised predictability of future investment performance. The certainty on the return on investment is increased (Rybach, 2010). Kenya is a very good example of a country in the African Rift Valley System where there has been significant geothermal development supported by clear geothermal legislation. The Geothermal Resource Act of 1982 has been used in Kenya as regards to guiding licensing, exploration, drilling and utilisation of geothermal resources (Ndetei, 2015). Another example of a country where significant geothermal development was facilitated by geothermal legislation is the United States of America. The Federal Geothermal Steam Act of 1970 was clear on the development of geothermal steam and associated land. The other policy legislation is the Energy Security Act of 1978 which provides for the deduction of intangible drilling costs and also has a percentage for reservoir depletion (Bloomquist, 2003. Policy interaction and sequencing is another important consideration if incentives to deploy any renewable energy (including geothermal) are to be effective. In addition to the incentives themselves, the existence of specific legal and regulatory provisions addressing the issues of land use, resource use, and allocation of rights need to be in place to avoid frustrating bottlenecks in renewable energy development (Azuela and Barroso, 2011).With clear policies and legislation in place private players can easily have market entry and financing with reduced risk premium as opposed to a situation where there is unclear policies and legislation in which case financiers raise the risk premium. There are legislative mechanisms which can be used to regulate power purchase and grid access and support a guaranteed market for renewable energy (including geothermal).Some of these mechanisms are Feed-In-Tariffs (FITs) and Renewable Portfolio Standards (RPS) can adopted by governments to promote the development of renewable energy (Abdmouleh et al 2015).

3.1 Feed-In-Tariffs (FITs)

The FIT arrangement offers a fixed and guaranteed price for generated electricity, a continuous availability and stability of the purchase/sale with a purchase obligation by the utilities for a specific long-time period contracts (15–20 years). The pre–established prices to be paid are generally above market rates for renewable power fed onto the grid. These tariffs, which may vary depending on the type of resource used, provide renewable generators with a set stream

of income from their projects (Abdmouleh et al 2015).The minimum tariff that is set in the FIT mechanism regulations enable project developers, investors and operators to reliably calculate yields for the first years of operation of the power plant. Legally stipulated FITs lead to successful market entry of private developers in solar and wind. In many cases after the establishment of a market it was possible to continuously reduce the FITs for solar and wind (Gassner, 2010). FITs play a major role for developers in designing their financial models necessary for bankability in accessing investment finance. FITs for geothermal energy have been successfully implemented in many countries such Kenya, Turkey and USA (Buscher, 2012).

3.2 Renewable portfolio standards (RPS)

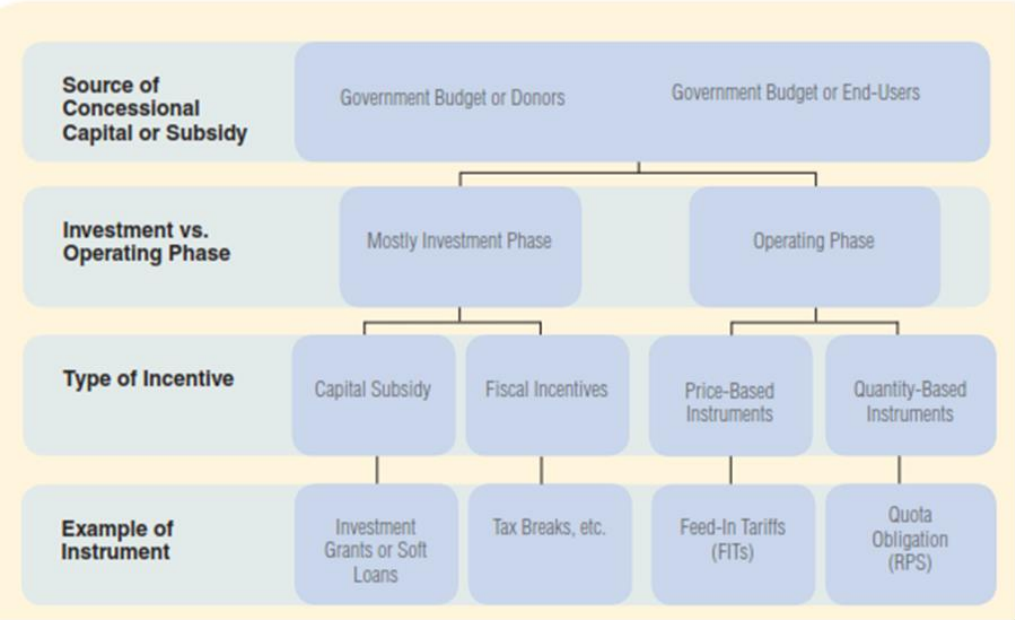
RPS policies are designed to increase the contribution of RES to the energy mix. In fact, they help increasing production electricity from high-cost sources with a market based approach and administratively effective. RPS requirements generally rely on private investments, often with government support, to promote RE growth (as opposite to FIT, which use public funds). The RPS has proved success in fostering renewable electricity production. The major benefit of RPS is renewable producer's benefit from continuous incentives in order to reduce costs. This is achieved by mechanisms that establish continuous cost competition among renewable producers for their share of the RPS. Geothermal energy generally has a higher capacity factor than other renewable energy sources for example Geothermal 91%, Biomass 83 %, Hydro 65%, Wind Onshore 43% and Solar Photovoltaic 33% (U.S.EIA, 2018).With the highest capacity factor compared to other renewable energy sources power producers can benefit more with Geothermal as regards to RPS.

4. Policy mix approach

A policy mix approach consisting of complementary instruments can be used by governments in promoting geothermal development. These instruments can be divided into two main categories namely operational support and investment support.

Operating support has the advantage of more directly influencing the ultimate outcome of renewable electricity delivered to the grid by rewarding actual power production, not just installation. Investment support, such as subsidised capital and fiscal incentives, can play a major role in the early stage of development (Gehringer and Loksha, 2012). Figure 4.1 below shows that there are many approaches to supporting the development of renewable energy including geothermal and that they can be adapted to a country specific approach

Figure.4:Policy and regulatory instruments supporting the deployment of renewable electricity



Source:World Bank (2012)

5. Discussion

In the last few years renewable energy auctions have been applied in wind and hydro. One of the most recent was the success of renewable energy auction for solar and wind in South Africa. (IRENA and CEM, 2015). As regards to geothermal development in the African Rift countries, auctions may be applied when the quantity or size of the geothermal resource has been established. In the case where the geothermal resource is not yet established or known an auction may prove challenging as the participants in the auction must know the size and capacity of power to be generated before participating in the auction. Where the resource is not yet known the FIT mechanism is better than auctions. A good example is in Turkey where the private sector companies like B.M Holding has used the FIT offered by the government. B. M. Holding proceeded to carry out exploration and development of a new field before reaching financial close and with the government guaranteed FIT made the project financially viable. It is also worthy to note that the European Bank of Reconstruction and Development (EBRD) started managing a fund, Medium Size Sustainable Energy Finance Facility (MidSEFF) lending money to local Turkish financial institutions at concessional rates like further accelerating geothermal development in Turkey (Oliver, et al., 2015).

An approach that has helped in exploration and development of some fields in Kenya is the Geothermal Development Company (GDC). GDC a government owned company carries out exploration and development of a field, thereby bearing all the risk from exploration to field development, and sells steam to power producers (Ngugi, 2012). The disadvantage with this approach is that it can be challenging to sustain especially in the early stages when the government is implementing austerity measures. However, this similar model is further supported by Oliver et al, in the case of Turkey were as of 2013 only 12 out of 13 fields had been explored and developed by the government where the resource was measured and eventually tendered out. This demonstrated that important role the government can play in geothermal development risk reduction and this can be applied in African Rift countries.

6 Conclusion

The scaling up of geothermal development in African Rift valley countries requires government support in the form of fiscal aspect such as tax incentives, subsidies, government guarantees and legislative aspect such as legally stipulated FITs and geothermal policy as in the case of the Kenya, USA and Turkey . A mix of policy instruments as shown in figure 4 can accelerate the development of geothermal industry as this can help in lowering the cost from exploration and drilling to power plant construction. Clear policies and legislative framework creates an enabling environment for the private sector have easy access to market entry and reduces investment risk.

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