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# Subsidies in Kenya's Geothermal Sub-Sector

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*Geothermal, Subsidy, public good, Guarantee, letter of support, letter of comfort, Feed in Tariff Policy, Tax holidays*

## ABSTRACT

Geothermal development in Kenya particularly during the early development phases has previously been subsidized by the Government. The Government of Kenya adopted the subsidy programme in the sector to aid security of supply, reduce electricity cost, de-risk high upfront costs of early exploration and drilling, and promote geothermal expansion investment and allow the scaling up of the industry. The existing geothermal generation tariffs thus contains high degree of subsidy and the government has been reluctant to approve upward tariff adjustment over time due to the need for the benefits of the government subsidy to be reflected in the tariffs as a public good.

Subsidies are offered at national level, but mainly at regional level. Subsidies cover mainly the investment phase, for drilling of development wells but also the purchase of equipment for the central production and can cover 30% or 40% of the investment.

Subsidization of early geothermal development is projected to be scaled back in relative terms over the future period due to tight budgetary constraints facing the government and allocation of resources to other priority and deserving spending programmes. Whilst it is the intention of the government to sustainably develop the country's abundant geothermal resources through other alternative avenues including private sector involvement in the early stages of development, there remains debate on the effectiveness of various incentives and subsidies and the issues on their design and affordability. The role of these different forms of subsidies needs to be assessed to evaluate their impacts and inform policy makers

This study focusses on identifying the several subsidy support schemes being applied in Kenya's geothermal sub-sector, their role in promoting geothermal development and the overall effects on geothermal tariffs. The results of the research is intended to make recommendation and advise policy makers on whether to retain, increase, remove or redesign the subsidy schemes in use Kenya today.

## 1. Introduction

The aspiration of Kenya's Vision 2030 is to realize 5,000 MW of electricity from geothermal sources by the year 2030 at a projected cost of US$ 20 billion. The Vision identifies energy as a critical enabler for transforming Kenya into a newly industrializing nation where citizens enjoy high standards of living in a clean environment.

In the short term, the country targets to increase installed generation by an additional 5,000MW from different energy sources. Geothermal is expected to contribute 1,600MW from Olkaria, Menengai, Suswa and Baringo-Silali geothermal projects. The development shall involve an engagement of both public and private sector participation. Geothermal Development Company (GDC) plans to generate an additional 1065MW of geothermal capacity by 2026 to be connected to the national grid.

Geothermal deployment rates have increased significantly following the introduction of financial and fiscal incentives by the Kenyan Government however, the sector isn't attracting the level of investment necessary to achieve national deployment targets, mainly because of the long timeframe required to confirm a geothermal resource, high upfront risks related to exploration and the significant capital investment required, ESMAP (2012).

The Kenya government, in its effort to achieve this ambitious short term and long term geothermal targets, adopted a series of several financial, legislative and policy interventions. Government interventions that encourage geothermal resource assessment, development, and capacity building have been considered as part of the all the government's policy development agenda.

The objective of these interventions is to enhance and scale up investment in the industry, aid in de-risking the high upfront costs of early exploration drilling, improve security of supply, reduce electricity cost, while at the same fast-tracking deployment of geothermal energy technology.

The intervention of the government through this programme and legislative and policy frameworks has generated significant interest from investors and focus is thus fast changing with emphasis now given to geothermal electricity generation. The new geothermal focus has saw new investments in the sector grow with 686MW of new additional geothermal capacities injected into the national grid between 2013 and 2017. Kenya has completed ten commercially viable IPP projects indicates the attractiveness of the incentives.

The interventions involve a blend of various combinations of incentives and subsidy programs. The existing geothermal generation tariffs thus contains high degree of subsidy and reflects surplus that the consumers enjoy. The government has recently been reluctant to approve upward tariff adjustment for both geothermal and other technologies in recent past due to the need for the benefits of the government subsidy to be reflected in the tariffs as a public good. For instance, KPLC's bid to double connection charges to KSh. 70,000 from KSh. 32,480 for households was rejected by the government as connection charges were considered a barrier to access to electricity.

The overall impact of these subsidies on the absolute tariffs and costs is perceived to have improved the competitiveness of geothermal energy viz-a-viz other alternative technologies and the surplus and benefits of the subsidies on tariffs passed to the consumers.

However, subsidization of geothermal development is projected to be scaled back in relative terms over the future period due to tight budgetary constraints facing the government and the

need for the allocation of resources to other priority and deserving spending programmes. Whilst it is the intention of the government to sustainably develop the country's abundant geothermal resources through other alternative avenues including private sector involvement in the early stages of development, there remains debate on the effectiveness of various government induced incentives and subsidies and the issues on their design and affordability. There is need to explore the role these different forms of subsidies and evaluate their impacts and inform policy makers on their effectiveness.

The subsidisation of geothermal projects is projected to be scaled back in relative terms overtime the period due to tight budgetary constraints facing the government and subsequent allocation of resources to other spending programmes. For instance, the cumulative growth in the total government budgetary allocation to Geothermal Development Company and Kenya Electricity Generating Company in fiscal year 2015/2016 declined to 6% compared to 55% growth allocations to the two companies in 2013/2014.

The total allocation from the National Treasury to the two main geothermal players in 2015/2016 was KES. 20 billion. The increase in total allocation to Geothermal Development Company, Kenya Electricity Generating Company, Kenya Power, Kenya Electricity Transmission Company, and Rural Electrification Authority fell from 58% to 29% in 2013/2014 and 2015/2016 respectively.

It is the intention of the government now to sustainably develop the country's abundant geothermal resources through other alternative avenues including private sector involvement. In order to provide a reasonable return on investment, the capital costs of geothermal development need to be covered in part by subsidies in the form of grants by the government in form of exchequer budgetary support or grants and concessionary funds from the donors.

The main focus of this paper is thus to give a broad overview of the different subsidy support schemes (financial and non-financial) in use in Kenya's geothermal energy sector including the annual budgetary support, the designs and their role in promoting geothermal development and their overall effects on geothermal tariffs. The intention of this report will be to make recommendation and advise policy makers on whether to retain, increase, remove or redesign the subsidy schemes in use Kenya today.

This paper will also provide geothermal investors with a deeper understanding of the kind of subsidy programmes available along the geothermal development life cycle in Kenya, and specifically the subsidy instruments most suited for geothermal investments.

## 2. Kenya's State of Geothermal Development

### *2.1. Generation mix*

Kenya is ranked among the leading countries globally with geothermal potential estimated at 10,000 MW. Geothermal energy is an attractive renewable energy which the country seeks to power its future.

Kenya's current electricity installed power generation capacity stands at 2,340MW comprising hydro 826MW (35%), geothermal 652MW (28%), thermal 776MW (33%, co-generation 28MW (1.2%), and wind 25.1MW (1%). Table 1 below provides generation mix in Kenya as at January 2018.

| Generation type | Installed MW | Effective MW | % (Effective) | % (Installed) |
|---|---|---|---|---|
| Hydro | 826.23 | 805.02 | 35.6% | 35.3% |
| Geothermal | 652.00 | 644.00 | 28.4% | 27.9% |
| Thermal (MSD) | 716.32 | 690.12 | 30.5% | 30.6% |
| Thermal (GT) | 60.00 | 55.00 | 2.4% | 2.6% |
| Wind | 25.50 | 25.50 | 1.126% | 1.1% |
| Biomass | 28.00 | 23.50 | 1.0% | 1.2% |
| **Interconnected System** | 2,308 | 2,243 | 99.1% | 98.6% |
| Off grid thermal | 30.61 | 20.69 | 0.9% | 1.3% |
| Off grid wind | 0.55 | 0.01 | 0.0% | 0.0% |
| Off grid solar | 0.69 | 0.62 | 0.0% | 0.0% |
| Imports | 0.00 | 0 | 0.0% | 0.0% |
| ***Total Capacity MW*** | **2,340** | **2,264.5** | **100.0%** | **100.0%** |

***Table 1. Kenya Electricity Generation mix***

The focus for the country now is to accelerate the development of geothermal sources to account for half of the country's needs and reduce the overreliance on the hydro generated power from the current 35%. As the country shifts more to geothermal energy, the final price of electricity is expected to continue declining, UNEP (2015).

### *2.2. Government incentives to promote Geothermal Development in Kenya*

The government of Kenya in its effort to accelerate and expand electricity access and promote the pace of geothermal development in the country has enacted the following policies, legal and regulatory measures including;

#### *2.2.1 Unbundling of the electricity sector*

In 2006, the government of Kenya, initiated reforms which saw vertical unbundling of the electricity sub-sector through the formation of separates entities to undertake steam development, generation, and distribution and transmission roles. Through the Energy Act of 2006, the government formed the Geothermal Development Company (GDC) to take up the initial resource development risks and open up the sector for private sector participation. Investment through the Geothermal Development Company (GDC) has been a key fiscal instrument for the country.

#### *2.2.2 Public Private Partnerships (Act No. 15 of 201)3*

The Kenya government is looking to the private sector to deliver a substantial portion of the geothermal requirements. The Public Private Partnerships Act of 2013 established the public private partnerships policy framework to support private sector which has stimulated private investors' geothermal appetite. The promulgation of the Public Private Partnerships regulation in 2014 have provided operational procedures for preparing, contracting, approval and implementation of PPP projects. Through the framework, Independent Power Producers and private players are now more involved in electricity sector and geothermal projects including at Olkaria and Menengai fields with an expected 750MW of additional capacities to be connected into the national grid when the projects are completed. Through this framework, the country has completed ten commercially viable IPP projects indicating the attractiveness of the incentives.

*2.2.3 Draft Energy Bill 2015*

The Draft Energy Bill 2015 which seeks to repeal the Energy Act of 2006 seeks to align the legal and regulatory framework of the energy sector with the Constitution of Kenya, 2010, and distinguish the role of the National and County Government in energy issues. The Bill is a renewable energy promoting strategy that recognizes the abundant renewable resources and other forms of energy including coal and nuclear. In addition, the Bill, establishes renewable energy authorities including Rural Electrification and Renewable Energy Corporation, Renewable Energy Resource Advisory Committee among others.

*2.2.4 Allocation of geothermal blocks to investors for development*

The government of Kenya through the Ministry of Energy and Petroleum has allocated geothermal prospects to private investors. The private developers involved in the sector include Ormat Technologies, Agil and Akiira. A couple of other investors have also applied for approval to develop other fields such as Homa Hills, and Barriers prospects.

*2.2.5 Feed in Tariff Policy*

The Feed in Tariff Policy introduced by the government in 2008 and subsequently revised in 2012 included a fixed tariff for geothermal. The FiT is a key instrument that seeks to promote power generation and attract private sector investment in the renewable energy sector including geothermal energy. The instrument is also meant to facilitate market stability for investors, reduce transaction costs, and administration costs and delay. (Boampong & Phillips 2016).

*2.2.6 Denomination of electricity tariffs*

Geothermal Power purchase agreements are also structured to factor in external risk factors and their impact on the profitability of the project. For example, the electricity tariffs are denominated in US dollars and thus eliminates the exposure of private foreign investors to foreign exchange rate risks. The operational and maintenance component of the tariffs are also indexed to allow for escalation. The tariffs cover the investor and ensures full cost recovery of investment through the power purchase agreements and steam supply agreement.

*2.2.7 Financial and fiscal incentive schemes*

The government of Kenya provides incentives in form of subsidies through the interest free grants, concessional finance, tax exemptions on geothermal equipment and machinery, government Guarantees i.e. letter of support/comfort/sovereign guarantees and full cost recovery of investment through the power purchase agreements and steam supply agreements.

## 3. Geothermal Subsidies

### *3.1. Concept and definition of subsidy*

The term ‘subsidy’ defy easy definition. The term is often used as an antonym to a tax and there is a perceived agreement that subsidy involves government and results in benefits for somebody. However, there is no universal definition on what exactly constitutes a subsidy and the methodology for their calculation. The definition of the term is typically tailored to specific purpose and they vary in terms of scope. The World Trade Organization (WTO) developed a general definition of subsidies that has been globally accepted and forms the

basis of understanding subsidies in general, energy and geothermal subsidies in particular WTO (2006).

The WTO defines three types of government programs that constitutes subsidies in its World Trade Report of 2006. According to WTO, a subsidy is deemed to exist if (1) there is a financial contribution by a government or any public body where; a government practice involves direct transfer of funds (e.g. grants, loans, and equity infusion), potential direct transfers of funds or liabilities (e.g. loans and guarantees); a government revenue that is otherwise due is foregone or not collected (e.g. fiscal incentive such as tax credits); a government provides goods or services other than general infrastructure, or purchase of goods, a government makes payments to a funding mechanism, or mandates, entrusts or directs a private body to carry out one or more of the type of functions or provision of goods and services on its behalf, (2) there is any form of income or price support, or (3) a benefit is conferred to either or both producers and consumers through regulatory policies or preferential rules.

World Trade Organization (WTO) clearly recognizes that subsidies need not directly generate from the government, but rather the government can mandate, entrusts or directs private actors to pay subsidies through regulatory policies or preferential rules. The term 'subsidy' used in this report denotes the term used in the WTO Agreement, and also considers other definitions particularly description of subsidies with respect to energy and geothermal. It considers the broadest definition and extends beyond the budgetary support and incorporate all financial and non-financial support by the Kenya government resulting in a change in conditions in Kenya's geothermal industry.

This report therefore refers "subsidies" as the financial and non-financial contribution by the government of Kenya or any public body towards geothermal development involving direct transfer of funds including grants, concessionary loans and equity infusion, transfer of liabilities including guarantees, government revenue that is foregone or not collected including fiscal incentive such as tax exemptions, and tax credits, provision of goods or services other than general geothermal infrastructure, or purchase of goods by the government, payments to a funding mechanism, or entrusting or directing of private body to carry pout one or more of the type of functions or provision of goods and services on its behalf, provision of income or price support, or conferring benefit to either or both geothermal producers and consumers.

### *3.2. Forms of subsidies schemes*

In order to assess the subsidy schemes of Kenya's geothermal development an extensive literature review was carried out covering the published reports, government reports, academic literature, Multinational corporation's publications and reports, and government policy documents.

The establishment of a comprehensive total energy subsidy and the existence of their benefits may pose challenges because different countries and agencies focus on different definitions of what exactly constitutes a subsidy.

Subsidies can take several forms including;

- **Direct transfer of funds**; e.g. grants, loans, and equity infusion
- **Fiscal incentives** e.g. tax rebates and breaks, tax exemptions and tax credits

- **Trade Instruments** e.g. tax exemptions on imported inputs and goods
- **Credit support** e.g. loan guarantee to finance energy infrastructure or preferential loan rates to producers
- **Liabilities and risk transfers** e.g. provision of letter of support, Letter of comfort and Guarantees
- **Regulations** e.g. provision of guarantee market and attractive tariff/prices including Feed in Tariff Policies and Renewable portfolio standards or quota mechanisms, tender schemes
- **Income or price support** e.g. below the cost of service prices on goods and services
- **Purchase of goods by the government** behalf of private body or a public entity
- **Government entrustment or directing** of private body/a public entity to carry out functions or provision of goods and services on its behalf

### *3.3. The rationale for subsidies*

Energy subsidies are virtually found in every country. Governments provide either explicitly or implicitly energy subsidies to producers and consumers or granted directly proportional to the real production. Governments have adopted energy subsidization schemes for several factors that includes:

First, countries have developed these schemes and other incentive programme to induce private investment in the renewables sector which involves high capital costs. Geothermal development requires significant capital investment costs and the government realized that the sector isn't attracting the level of investment necessary to achieve national deployment targets. This compounded with long timeframe required to confirm a geothermal resource and high upfront risks related to exploration necessitated the government to stimulate private capital into the industry through subsidies, ESMAP (2012.

The second basis for subsidies is that it aids security of electricity supply. Increasing the diversity of national generating portfolio reduces reliance on hydropower which is susceptible to weather vagaries. Promotion of new sources of energy also improves energy security which is vital for economic development.

The third justification provided by countries for the use of energy subsidies particularly in developing economies is the need for social welfare protection. Governments is responsible for the provision of social goods and services and such its responsible for driving the distribution and socio-economic agenda of increased electricity access and helping cushion poor consumers from high electricity tariffs. The reduced tariffs is expected to foster an increase in economic activity (industrial, services, agricultural, commercial) and social wellbeing (households and social institutions).

It is for this basis that governments subsidies and has been reluctant to approve upward tariff adjustment over time due to the need for the benefits of the government subsidy to be reflected in the tariffs as a public good. Provision of subsidies is seen as a way of compensation for high costs of electricity tariffs that can raise costs of living. Governments aim is therefore to make electricity affordable and accessible to retail customers who cannot afford owing to poverty.

Fourth, governments have deployed various subsidies policy tools to promote clean energy development and protecting the environment. Provision of subsidies to renewable energy sources is a way of greening and protecting the environment and fighting climate change.

Pursuit of industrial development, building infrastructure, help struggling industries or foster new ones, support creation of new knowledge through research and development, are other justification why governments provide subsidies in electricity sector.

The Government of Kenya adopted the subsidy programme in the sector to aid security of supply, reduce electricity cost, de-risk high upfront costs of early exploration and drilling, and promote geothermal expansion investment and allow the scaling up of the industry. The existing geothermal generation tariffs thus contains high degree of subsidy and the government has been reluctant to approve upward tariff adjustment over time due to the need for the benefits of the government subsidy to be reflected in the tariffs as a public good.

### *3.4. Arguments against subsidies*

The broad argument that electricity subsidies can lead to higher private investment, reduced poverty and improved energy security is based on specific claims with respect to a range of underlying objectives. Most of these underlying objectives have either an economic efficiency rationale i.e. reflects a market failure of some kind, or are concerned with reallocating income for social equity or political patronage. The effectiveness of subsidies from an economic, financial and social perspectives and how to address their design and affordability of these programmes is the debate of the energy industry, Meier P., et al., (2014).

The International Monetary Fund, in a robust assessment of energy subsidies in 176 countries, has revealed that the global tab for government energy subsidy by developing and industrialized countries was $1.9 trillion in 2011. Globally the countries that provide the largest energy subsidies are US (Sh42.9 trillion), China (Sh23.8 trillion), Russia (Sh9.9 trillion). (IMF, 2010).

In the paper, “Energy Subsidy Reform: Lessons and Implications”, IMF economists argue that energy subsidies are expensive and undermine governments’ efforts to reduce budget deficits. subsidies crowd out priority public spending in healthcare, infrastructure and education. Subsides encourage excessive energy use, reduce incentives for investment in renewable energy, accelerate depletion of natural resources and exacerbate global warming.

Large energy/electricity subsidies are costly and compete for limited resources with other essential services, widen the scope for rent-seeking and commercial malpractice, discourage both supply-side and demand-side efficiency, promote noneconomic consumption of energy, and rendering renewable energy uncompetitive.

Heavy subsidies on electricity tariffs potentially distort the relative costs of electricity, leading to inefficient allocation of prices.

Subsidies intended to benefit electricity customers, or to stimulate generation, may be less effective than intended as leakages occur.

## 4. Kenya's Geothermal-Specific Subsidies

The government of Kenya has deployed various policy tools to promote clean energy. The government has adopted the subsidy programme in the geothermal sector to reduce electricity cost, de-risk high upfront costs of early exploration and drilling, and promote geothermal expansion investment and allow the scaling up of the industry. The existing geothermal generation tariffs thus contains high degree of subsidy and the government has been reluctant to approve upward tariff adjustment over time due to the need for the benefits of the government subsidy to be reflected in the tariffs as a public good.

Broadly speaking, subsidies that the geothermal industry enjoys includes direct and direct subsidies, and research and funding in research and development for geothermal entities. The country uses a combination of mechanisms to support geothermal development in the country.

### *4.1. Forms of geothermal subsidies*

Kenya has put in place several financial and non-financial subsidies schemes to geothermal companies utilizing the resource for electricity generation.

Geothermal specific subsidies in the country include;

#### *4.1.1 Direct financial support*

International Energy Agency's (IEA) World Energy Outlook 2016 estimates that subsidies to renewables as at 2016 are approximately $150M, out of which 80% are directed to the power sector. Global subsidies trend to renewables are expected to decline from a peak of $240M by the 2030s and by 2040's majority of renewables-based generation will be competitive without any subsidies. It is estimated that a 40% increase in generation from renewables comes with only a 15% increase in cumulative subsidies, IEA (2016).

The government supports the geothermal sector with direct annual budgetary allocations in the national budget through the MTEF process in form of cash subsidies and grants. Key expenditure areas are national electrification, renewable energy and petroleum exploration. On average, about 95 per cent of the energy sector expenditure goes to expansion of the national grid, rural electrification and expansion in geothermal power generation, UNEP (2015)

The Kenya government spent $20 billion on geothermal development 2015/2016 to both GDC and KenGen. The cumulative total subsidy support for the two geothermal players through the capital grants, concessionary loans, research and development support is in excess of $USD 50 billion from 2013 and 2016.

The total allocation to Geothermal Development Company, Kenya Electricity Generating Company, Kenya Power, Kenya Electricity Transmission Company, and Rural Electrification Authority from FY 2013/2014 to FY 2015/2016 is approximately in excess of $USD 50 billion.

The government has also facilitated the financing of projects through green funds. The Climate Investment Funds (CIF) have funded Kenya's multiple renewable energy resources including geothermal to enhance energy security, improve access to electricity, reduce the cost of supply, and bring substantial economic, social, and environmental co-benefits to local communities.

In addition, Kenya Power with support from the World Bank Global Partnership Output Based Aid (GPOBA) Programme is implementing a Slum Electrification Programme that aims to connect residents in slums and low income rural areas to the national grid at a subsidized charge of KSh. 1,160 per connection. Under the subsidy program, GPOBA and KPLC contribute US$ 225 (KSh. 19,350) and KSh. 11,970 per connection, making up the standard capital contribution of KSh. 32,480.

These funds have been crucial in opening up and preparing project for financing by other entities and reduce the effective investment cost of a project to a level that shall ensure the economic and financial viability of a project. They also reduce the funding requirements and eases funding. Subsidies are also easy to implement and administer

This form of investment subsidies has been a popular measure to promote the investment in capital intensive geothermal power projects in the country.

*4.1.2 Feed in Tariff Policy*

The Feed in Tariff Policy was enacted by the government in 2008 with the objective of promoting power generation and attract private sector investment in the renewable energy sector. The policy is also meant to facilitate market stability for investors, reduce transaction costs, and administration costs and delay. (Boampong & Phillips, 2016).

The policy guarantees geothermal generation tariff of 8.8 cents/kWh with power utility, Kenya Power & Lighting Company (KPLC) over a fixed 20-year period for power delivered at the interconnection point. This guaranteed tariff is higher than the average tariff of USc 7/kWh paid for power normal plants. Kenya Power is obligated to buy or pay the power from these sources regardless of merit order considerations.

Research shows that developing countries that have introduced FiTs are four times more likely to attract investment in renewable energy than countries which such support mechanism don’t exist, Meier P., et al., (2014).

Projects with a total capacity in excess of 3,293MW have been approved for development under the Feed in Tariff framework by 2016, LCPDP Report (2016). The wellheads currently in operation at the Olkaria Geothermal field are structured along the Feed in Tariff Policy framework.

The main advantage associated with the FiT systems is that the tariffs can be effective as well as efficient set at the correct level. They are flexible and allows for a targeted promotion of different technologies. The policy reduces market risk due to price certainties, and promotes bankability of projects.

The main demerits of the FiT Policy is that it might lead to higher cost for economy in the short term, and the need for a well-informed regulation and experiences with renewable technologies.

*4.1.3 Duty and tax rebates*

Kenya’s VAT Act provides for removal of VAT, zero-rating of import duties, customs duties and tax exemptions on the procurement of plant equipment and related accessories for geothermal power generation and transmission during project implementation. In addition, the procurement of spare parts is free of duties and taxes.

*4.1.4 Tax holidays/exemptions*

To encourage investment in geothermal development for electricity generation, Government of Kenya through the National Treasury's Legal Notice 91 of 2015 put in place tax incentives including tax exemptions on interest on loans advanced from foreign sources, provided the funds are utilized for investment in infrastructure.

Legal Notice 165 of 2015 also grants exemptions from withholding tax on payments made to non-resident persons for services rendered under a power purchase agreement.

Legal Notice 106 of 2015 in regards to stamp duties grants an exemption from stamp duty on the registration of security documents relating to loans from foreign sources utilized in investing in geothermal infrastructure.

The government provides for ten-year tax holiday for geothermal plants of at least 50MW, seven years for plants in the range of 30-49MW, and five years fir plants of capacities between 29-10MW

The policy also provides for tax holidays on dividend incomes from investments made from domestic sources.

*4.1.5 Low cost concessionary loans*

Geothermal developing entities have received support through low cost loans from the government owned development banks and Multilateral and bilateral development institutions, including the World Bank, African Development Bank (AfDB), Scaling-up Renewable Energy Program (SREP), French Development Agency (AFD), Nordic Development Fund, European Investment Bank, Exim Banks, Japan International Cooperation Agency (JICA), Kreditanstalt für Wiederaufbau (KFW), Japan Bank of International Cooperation (JBIC) and PROPACO and DEG.

The interest charged on these loans sourced from these funding institutions is in the range of 0.75% and 2% with grace period in some loans more than 10 years.

A sample of low-cost concessionary loans for different geothermal projects in Kenya are shown in the table below;

| No. | Financier | Support (MUSD) | Project |
|---|---|---|---|
| 1. | WB | 120 | 280 MW Olkaria I & IV |
| 2. | EIB | 168 | 280 MWe Olkaria I & IV |
| | | 36 | 460 MW Menengai |
| 3. | AfDB | 120 | 460 MW Menengai |
| 4. | JICA | 323 | 280MWe Olkaria I & IV |
| 5. | KfW | 94.6 | 280MWe Olkaria I & IV |
| | | 102 | 200MW Baringg-Silali |
| 6. | AFD | 210 | Olkaria I & IV |
| | | 170 | 460 MWe Menengai |
| 7. | China Exim Bank | 95.4 | 280MWe Olkaria I & IV |

*4.1.6 Government Guarantees – letter of support/comfort*

The financial stability of Kenya power allows investors to invest without reliance on sovereign guarantees. The government has provided private investors and IPP's with letter of support to cover political risks in order to obtain financing of their projects. The government has also facilitated the Partial Risk Guarantees for geothermal projects to protect the project and investors from political event or any event or circumstance whether arising from an action or inaction of GOK or any Governmental Authority which adversely affects the project. 105MW Menengai project is an example of the projects that the government has facilitated the acquisition of the Partial Risk Guarantees from AfDB.

*4.1.7 Capacity building, research and development*

The government of Kenya has financed capacity building efforts, trainings, research and development through Geothermal Development Company (GDC), and Kenya Electricity Generating Company (KenGen). These subsidy provision by the government to the two public geothermal entities has enhanced country's technical expertise.

R&D subsidies, grants for demonstration facilities, special loans only indirectly affect the geothermal energy or electricity market. They aim at strengthening the generation industry and creating knowledge and know-how.

### *4.2. Financing and impact of geothermal subsidies*

Geothermal subsidies have impacts on the cost of generation, and the change in the cost of generation affects the future cost of electricity for the nation. The result is a shift of electricity supply curve to the right. The benefits of the subsidy can be measured by the differential between the geothermal cost with or without the subsidy, Knutsen (1976).

The subsidies reduce the cost of geothermal energy and that this cost reduction will result in an even lower present value system cost, thus increasing the benefits. The benefit of each subsidy is the incremental difference it causes in benefits from geothermal energy introduction

The direct impact of the subsidies on consumer tariffs is estimated at 1.8 cents/kWh or 25% of the estimated 7.0 cents/kWh. It is clear that such subsidized tariff component, and the consequent consumer surplus that accrue to all consumers in the country is substantial. Without subsidy, the average cost of electricity to the final consumer is expected to rise considerably

## 5. Conclusion

Kenya's geothermal industry enjoys substantial direct and direct subsidies on early geothermal development, research and funding in research and development for geothermal entities. Many of the geothermal subsidies in Kenya take the form of both explicit budgetary transfers and government mandates. The subsidy programmes adopted in the geothermal sector has reduced electricity cost, de-risked high upfront costs of early exploration and drilling, and promote geothermal expansion investment and allow the scaling up of the industry.

From this study, subsidization of geothermal power production is found to be a necessary condition but not a sufficient condition for achieving the 5,000MW target by 2030.

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