

POLICY Brief

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The Role of Renewable Energy on Industrialized Economy in Tanzania: Energy Access and Policy Perspective

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Summary

Access to energy is still a challenge to the majority of people living in the rural areas of Tanzania. There has been more focus on large hydropower and thermal power projects leaving other sources of Renewable Energy underexploited. Climate change and unpredictable high fossil prices necessitate the shift into Renewable Energy. Tanzania has great potential of Renewable Energy which could supply more than 50% of the electricity. This policy brief elaborates the potentiality of Renewable Energy on the context of industrialization economy in Tanzania. It calls for promotion and capacity building on issues of Renewable Energy both in schools and community, a stand-alone Renewable energy policy, involvement of the topic of Renewable Energy exploitation in policies, strategies and plans to all levels. And Public Private Partnership (PPP) as a solution for RE financing.

Introduction

Energy access is essential in the development of any country. Nowadays, sustaining the energy demand using renewable energy (RE) resources has been a real challenge due to climate change, an increased wealth generation and other drivers for social economic development. In general, rural areas have much RE resources for decentralized RE technologies. The Tanzania electricity supply industry reform strategy (2014-2025) indicated that there are many RE resources but only a small fraction is harnessed, and that while the number of rural population without electricity is expected to increase, the country is still struggling to provide adequate levels of electricity services especially to poor people in the rural areas.

However, since the introduction of the national energy policy 2015, the following has been achieved on the energy sector; establishment of Energy and Water Utilities Regulatory Authority (EWURA); operationalization of Rural Energy Agency (REA) and Rural Energy Fund (REF); formulation of Small Power Producers Association (SPPA); increased number of players in the petroleum industry; reliable supply

of petroleum products; operationalization of the Bulk Procurement System (BPS) for petroleum importation; formulation of Model Power Purchase Agreement (MPPA); formulation of Electricity Act 2008, Power System Master Plan (PSMP) 2009 – 2033; increased power generation installed capacity from 891 Megawatt Electricity (MW) in 2003 to 1,483 MW in 2014; increase in annual electricity consumption per capita from below 80 kilowatt hour (kWh) in 2003 to 105 kWh in 2014; increased electricity connection levels from below 10 percent in 2003 to 30 percent in 2015; formulation of the Electricity Supply Industry Reform Strategy and Roadmap 2014 – 2025; increased natural gas discovery from 8 Trillion Cubic Feet (TCF) in 2003 to 255.08 TCF in March 2015 as well as completion of Natural Gas transportation pipeline from Mtwara to Dar es salaam and the associated facilities.

Despite the achievements, the Energy Sector faces a number of bottlenecks including: low private sector participation in large scale power generation; over-reliance on few generation sources; unreliable and expensive energy supply; overdependence on Government subsidies; low access to modern energy services; inadequate human resource with requisite skills and knowledge; low participation of Government and Tanzanians in the

petroleum value and supply chain; inadequate financial resources to develop the sector; and inadequate research and development.

Tanzania has abundant energy resources which include natural gas, coal, uranium, hydro, biomass, solar, wind, geothermal, tidal and waves. The energy policy 2015, indicated that the average solar insolation is about 200 Wp/m² and several sites with wind speed ranging from 5 to 9 m/s have been observed. Tanzania has confirmed uranium deposits of about 200 million pounds.

Energy Profile of Tanzania

Energy Consumption

The main source of energy for rural Tanzanian households is traditional biomass whereby other modern sectors are dependent on imported petroleum. The country has abundant RE resources but only hydro is currently being exploited in a renewable manner at a capacity of 10 MW per year. The ESI indicates that about 67.5% of the total population has access to electricity services of which 49.3% is in rural areas.

According to the rural electrification program, Tanzania has targeted to have an electrification rate of 50% by 2020, 64% in 2025, 76% in 2030, and 90% in 2035. Consequently, the country faces a lot of challenges on energy access which are caused by an unpredicted level of use of firewood and charcoal as well as high connection costs, followed by a high and frequently unstable price of petroleum.

Electricity Access and Generation Capacity

The demand for new electricity connections has increased due to the improved energy policy done by the government, by increasing the electrification rate through Rural Energy Agency (REA). In 2013, the Government issued new electricity connection charges by lowering the connection charges in rural and urban areas. According to the power system master plan (2016), for large and medium-scale hydro power projects, twenty-three (23) projects with a total installed capacity of 4,765MW are identified as power development options. Four (4) planned projects out of those, i.e. Rumakali, Rusumo, Ruhudji and Malagarasi Stage III, were committed projects in the PSMP2012 Update. However, only the Rusumo Project is at the stage of implementation, and in the process of bidding for contractors as of December 2016.

In general, Tanzania is still depending on hydropower as the main source of electricity which is highly prone to climate variability. According to ESI, In the year 2014, the

power installed capacity was 1483 MW, comprises of Hydro 562 MW, Natural gas 501 MW, Liquid fuel 420 MW. The Energy Policy (2015) added that, another Gas fueled power plant, Kinyerezi I with 150MW capacity was commissioned, thereby increasing the total generating capacity to 1,633MW with a 10,000MW target by 2025. The application of RE technologies have the potential to alleviate the poverty a major percentage of the rural population of Tanzania is facing right now. On top of that they will be a viable option because RE technologies can easily be decentralized thus providing energy in areas far from the national grid.

Renewable Energy Vs Fossil Fuels

Renewable energy comes from natural resources that can be replenished during an average human lifetime and includes solar, wind, hydro, geothermal, and biomass. Fossil fuels, on the other hand, can take thousands—or even millions—of years to naturally replenish and include, natural gas, coal, and oil. Fossil fuels dominate energy generation in Tanzania, however, it's reasonable to assume the percentage of renewables will continue to outgrow fossil fuels for the foreseeable future. These days, the energy produced by renewables is just as affordable as energy produced by fossil fuels. Renewable energy generation is cleaner, easier to sustain over time, expanding more rapidly, and sometimes even cheaper than fossil fuels.

Electricity Supply Reform Strategy 2014-2025

This Strategy recommends for gradual unbundling of the state owned utility company into independent generation, transmission and distribution companies with much emphasis of private sector participation in the entire supply chain with exception of transmission segment. to create an environment conducive to attracting investment in the Electricity Supply Industry (ESI) which will support the country's development goals.

Drivers for the ESI Reforms

The ESI infrastructure is reported to be one of the major constraints in the Government of Tanzania (GoT) efforts to achieve the desired socio-economic goals articulated in the Tanzania Development Vision 2025. The main drivers for reforming the ESI in Tanzania were;

- i. **Policy, Legal and Regulatory Framework-** Section 40 of the Electricity Act, 2008 sets a platform for the re-organization of ESI

- ii. **Financing Requirement**-The private capital investment becomes an important option to bridge the financing gap
- iii. **Connection and Access Levels to Electricity**-Low connection and access levels to electricity coupled with low purchasing power have excluded rural households from participating effectively in income generating activities
- iv. **Diversification of Power Generation Resources**-To improve the security of supply, the GoT is diversifying the sources of electricity generation to include natural gas, coal, hydro, uranium and renewable energies
- v. **Demographics and Demand Projections**- To become a semi-industrialized country and effectively participate in the global economy, growth in productive sector of the economy. Such growth will require enormous investment in the power infrastructure.
- vi. **Stakeholders' Expectations**- The availability, reliability, affordability, accessibility and quality of electricity supply have been major concerns by stakeholders including GoT, customers and business partners.
- vii. Ensuring prudent management of petroleum resources and accrued revenue for the lasting benefits to the society;
- viii. Promoting usage of locally produced goods and services in the petroleum industry;
- ix. Strengthening institutional, legal and regulatory frameworks and developing human resource to ensure development of a sustainable Energy Sector; and
- x. Promoting compliance with environmental, health and safety standards in the Energy Sector.

Considering the Industrialization of the country, a lot of activities will be going on. This means that land will be destroyed, chemicals will be used and energy will be harnessed from different resources which will lead to pollution and an increase of emission. Consequently, the process of climate change will be accelerated. The use of RE energy sources will play a main role in order to cut off the carbon emission and make industrialization in Tanzania sustainable. This will enhance social economic development from both the rural and urban communities.

Related Renewable Energy (RE) Policies and Practice

The Government intended to develop RE sources to minimize production costs. Tanzania has continued to improve its energy policy and regulations in order to encourage Independent Power Producers (IPP). According to the national power master plan 2016, the government aimed to contribute to at least 260MW of new renewable power generation being connected to the national grid by 2018. This goal should be achieved through a wind project of up to 200 MW per year from Singida, Njombe, and Dodoma. Possible candidates for power generation expansion (Renewable energy and import) are as indicated in the figure 1.1 below;

Project	Earliest Com. Year	Capacity	Cost	Rank
Mbeya Geothermal	2025	100MW (2025) 200MW (2026)	(\$4,362/kW)* ¹	D
Singida Wind	2018	50MW	\$136M* ² (\$2,720/kW)	C
	2019	75 (in 2019)- 200MW	(\$1,571/kW)* ³	C
	2020	100MW	(\$1,571/kW)* ³	C
Njombe Wind	2019	100MW	(\$1,571/kW)* ³	D
Shinyanga/Simiyu Solar	2020	150MW	(\$1,200/kW)* ³	D
Dodoma Solar	2019	50MW	(\$1,200/kW)* ³	D
Import (Ethiopia)	2018 2020	200MW Max 400MW		A

Note: Criteria for Ranking; A- Financing Closed or Construction started- PPA (BOT/EPC) contract signed- F/S, pre-F/S completed- F/S, pre-F/S not completed.

Source: Power system master plan 2016

Energy Policy 2015

The first National Energy Policy (NEP) for the Country was formulated in 1992 and it got replaced in 2003. After a strengthening of the Energy policy in 2015, it can be said that RE has only been a small part of the policy and that it should be reviewed. The major drives of the 2015 NEP were;

- i. Creating a conducive environment for private capital investment in the Energy Sector;
- ii. Expediting access to modern energy services through development and expansion of energy infrastructure;
- iii. Developing energy resources to adequately meet domestic energy demand and facilitation of energy trading;
- iv. Promoting energy alternatives including renewable energies to enhance diversification of energy mix;
- v. Enhancing energy efficiency and conservation in all sectors;
- vi. Optimizing benefits to the Government and the people of Tanzania through strategic participation, interventions and equitable benefit sharing;

- Mainstreaming energy & RE into national, district and village development policies, strategies and plans

Recommendations

- Tanzania must promote RE as alternative source of energy
- A clear definition is required for clean energy, alternative energy, modern energy on issues of RE
- Off grid solutions should be given priority to minimize the infrastructure cost.
- A separate RE Policy has to be prioritized
- Research on effectiveness of different RE sources has to be given priority
- The focus for RE should be beyond provision of lighting services
- Implementation of the initiatives for scaling up the RE
- Public Private Partnership (PPP) is required to find the solution for RE financing.

Conclusion

Tanzania has great potential of RE which could supply more than 50% of the electricity. There has been more focus on large hydropower and thermal power projects leaving other sources of RE underexploited. Climate change and unpredictable high fossil prices necessitate the shift into RE. promotion and capacity building on issues of RE both in schools and community is needed.

There should be a stand-alone RE policy for easy facilitation of projects. There is a need to involve the topic of RE exploitation in policies, strategies and plans to all levels. Public Private Partnership (PPP) is required to find the solution for RE financing. By doing so fossil energy and RE challenges could be solved.

For Further Reading

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About Production of this Policy Brief

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