A CRITICAL ASSESSMENT OF THE NIGERIAN RURAL ELECTRIFICATION POLICY

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Abstract
In general, a rural area is a geographical area that is located outside a city or town. They are usually large and isolated areas of an open country with low population density, with mainly agriculture and activities around agricultural services as the main occupation. The major distinction between rural communities and urban centers is that while urban centers are large, impersonal and complex in social structure; rural areas are small, intimate and simple in organization. The problem of access to modern energy services is a major developmental issue confronting rural communities globally, particularly in Asia and sub – Saharan Africa. Modern energy services are benefits derived from modern energy sources such as electricity, natural gas, clean cooking fuels and mechanical power, that contribute to human well –being . According to IEA (2009) worldwide 1,456 billion people do not have access to electricity, of which 83% live in rural areas. In sub – Saharan Africa less than 10% of the rural population have access to electricity. Currently in Nigeria, it is estimated that over 70% of the population live in rural areas with less than 15% of them having access to electricity. This study takes a critical look at the problems and constraints of rural electrification in Nigeria. The study appraises the various policies and practices that have driven rural electrification in Nigeria, the level of implementation and the prospects of providing universal access to electricity services in rural areas of the country.

Keywords: *Rural areas, Electricity, Policy, Nigeria*

Background to the study

Rural areas are geographically secluded community with low population density and frequently characterized by a low level of income and education (Niez, 2010). The nature of rural areas varies from place to place and different types of rural areas are defined by how accessible they are from the urban areas. This range from the rural urban fringe; the very edge of the city, beyond the suburb, where country side and city merge to the extreme (remote) rural areas. The major distinction between rural communities and urban centres is that while urban centres are large, impersonal and complex in social structure; rural areas are small, intimate and simple in organization.

Rural energy consumption involves principally household energy uses, which is the biggest energy user in the sector, with cooking being the major end use of about 85% of total rural energy use. The cooking devices are usually inefficient, inconvenient and sometimes dirty. Agriculture uses 2 to 8% of total rural energy and includes uses for irrigation and mechanical equipments. Lighting constitutes 2 to 10% of total rural energy use while the use of radios, televisions and small appliances are insignificant.The electricity demand curve

in rural areas usually involves high peak in the early evening hours and low overall consumptions. Rural industries utilize less than 10% of total rural energy use, while religious festivals, celebrations and other occasional functions provide spikes in energy demands.

Rural electrification is the process of bringing modern energy services and electrical power to rural and remote areas. Modern energy services are benefits derived from modern energy sources such as electricity, natural gas, clean cooking fuels and mechanical power, that contribute to human well –being (Modi et al, 2005). Electricity is used not only for lighting and household purposes, but it also allows for mechanization of many farming operations, such as threshing, milking, and hoisting grain for storage. In areas facing labor shortages, this allows for greater productivity at reduced cost. Access to modern energy services and rural development are inextricably linked (Barnes and Floor, 1996; Chaureyet al., 2004). According to Ranjit and O'Sullivan (2002): Access to modern energy can be defined as a household's ability to obtain an energy service, should it decide to do so. Access is a function of availability and affordability. For energy to be considered available to a household, the household must be within the economic connection and supply range of the energy network or supplier. Affordability refers to the ability of the household to pay the up-front connection cost (or first cost)and energy usage costs. A high up-front cost may discourage poor households from making a switch to a modern energy form.

The problem of access to modern energy services is a major developmental issue confronting rural communities globally, particularly in Asia and sub – Saharan Africa. According to IEA (2009) worldwide 1,456 billion people do not have access to electricity, of which 83% live in rural areas. In sub – Saharan Africa less than 10% of the rural population have access to electricity. Currently in Nigeria, it is estimated that over 70% of the population live in rural areas with less than 15% of them having access to electricity. Most rural societies experience limited access to modern energy services, due to problems of availability and/or affordability, and instead rely on traditional fuels, predominately animal dung, crop residues, and wood – for majority of their energy needs. When burned, traditional fuels often produce hazardous chemicals with negative health impacts, especially when used indoors. The fact that traditional fuels cannot produce a range of modern energy services such as mechanical power and electricity limits their ability to improve other aspects of life, including education and employment.

Also, traditional fuels also produce energy inefficiently, as a result, they require substantial time and effort to collect, and as local resources stocks decrease they increasingly have to be sourced from further afield. This significantly reduces the time available for productive activities. If managed ineffectively, such resources use can also degrade the environment and create negative spillover effects in other sectors. Given the cultural practices in many rural areas, these impacts are often most felt by women and children.

The objective of this study is to highlight the current trends in rural electricity supply, the policy instrument driving the process in Nigeria and the current constraints and challenges facing the sector in the country. The study concludes by recommending specific action plans and government policies to improve rural electrification in the country. The paper is structured into five major sections. The first includes the introduction, while the second section looks at the models of rural electrification globally. The third section discusses the historical development of rural electrification in Nigeria, its current status and practices, including the various government agencies involved in the implementation of the policy across the country. Section four gives an overview of the development and makes policy recommendation for improvement. Section five concludes.

Rural Electrification: Concept, Policy and Technology

Concept of Rural Electrification

Basically, the concept of rural electrification refers to the process of providing electricity supply to rural areas or areas outside the city centres. This concept of rural electrification has raised a lot of divergent interpretations among scholars. In the opinion of Munasinghe (1990) he observes that rural electrification schemes are often defined in terms of local administrative units, mainly for the convenience of implementation. In an earlier work, (Munasinghe, 1998), he asserted that 'rural electrification" simply refers to connections to a central grid and was of the opinion that this is not necessarily the most economical method of electrifying every region in every country. Based on international discussion and understanding by various international agencies, Vogel (1993) is of the opinion that the concept of rural electrification does not only refer strictly to rural areas as defined in the country statistics but may also include small to medium – sized towns which are service centres for the surrounding rural areas within a given region.

Maillard et al (1985), however states that an exact definition of rural electrification raises the issues of delimiting urban and rural areas. They argue that a differentiation on the basis of statistical data carries with it the danger of inaccuracy because of the differences between countries and the fact that data are often unreliable, especially considering the fact that classification of urban and rural areas based on statistical data, disregards specific features and opportunities of both areas. They then proposed definition: "rural electrification comprises all the activities aimed at enabling users situated outside major cities to have access to electricity. The electrification process can be differentiated from the conventional scheme of a national grid, as it covers everything up to independent configurations supplying power for a specific determined need, and the solving of specific technical and economic problems".

Even though globally, most rural electrification projects refer to communities of between 500 and 2000 people, both Mason (1990) and Foley (1990) state that the definitions of rural electrification vary considerably between countries. In one country 'rural' also includes provincial towns with population up to 50,000 and in another it refers to small farming villages and surrounding areas. One of the consequences of these differences in interpretation is that a comparison between rural electrification projects in different countries is extremely difficult if not impossible. Mason (1990) correctly states that a uniformity as to interpretation is not per se necessary, but it is important to identify those areas that require special financing, technical and institutional approaches.

These views were confirmed by experiences in Ireland with the rural electrification programmes of the 1940s and 1950s. Shiel (1984) stated that the meaning of "rural" was defined by the Electricity Supply Board and government of Ireland to exclude towns and villages with populations of over 250 were not considered rural, nor were isolated loads of over 100 kVA maximum demand. After some time, this definition led to the peculiar situation where the areas surrounding villages were electrifiedwhile the villages with over 250 inhabitants had no electricity or had to rely on inadequate local generation. A redefinition of the concept of 'rural' was needed. This experience also shows the importance of a planned approach that takes the whole area into account.

Thus in the context of this study "rural electrification" encompasses the activities designed to provide people with access to electricity and other modern energy services in those areas which show specific features. These features do not only include low loads and the need for special approaches as suggested by Mason, but also area specific opportunities. The method generally used for supplying electricity to these areas include connection to a regional or national grid, the use of renewable energy technologies like solar or wind systems or the use of distributed systems serving single or several consumers. The method of

utilizing this electricity supply means vary depending on local circumstances and the degree of saturation of the electricity supply.

Rural Electrification Policy

Globally, rural electrification policies are shaped according to various energy needs, resources and target groups; as well as the challenges and anticipated benefits to the individual rural communities. The challenges faced by individual communities may include distance from natural or regional electrification grids, accessibility of the community, harsh climatic conditions that render electrification through grid extension a perilous task. Other challenges that influence policy choices in rural electrification include the fact that rural communities are highly dispersed with low population density and characterized by a low level of education, low load density generally concentrated at evening peak hours and low revenues.

The actual benefits of rural electrification policies are based on the specific objectives of the programme. These specific objectives can be grouped into four categories: economic objectives, social objectives, political objectives and environmental objectives. In some countries rural electrification is based on the reduction in the growing disparity between rural and urban areas with its social consequences and resulting urbanization as its main objective; while in other countries, the improvement of social conditions or the discouragement of the unrestrained expansion of decentralized and non – standardized power systems typically had priority. Thus the success and actual impact of any rural electrification policy must be premised on its basic objectives.

This has become necessary because electrification of rural areas has often been seen as a remedy to a number of problems such as deforestation for fuel wood, poverty and migration to urban areas. It is very important that rural electrification programme objectives must be clear and explicit for assessment and evaluation purposes. Electrification aiming at economic development through agricultural production growth for instance, should be addressed and evaluated differently from electrification for purely social reasons.Thus the success of any rural electrification policy will depend to a large extent on the definition of the rural community, specific objectives of the programme, investment costs, the number and size of local contributors and the total number of potential consumers.

In most developing countries, rural electrification policies are driven by the existing economic inequalities between urban and rural populations and these countries' social equity objectives tend to be the main drivers to providing electricity access to isolated populations. By doing this, governments of developing countries seek to improve the living standards of their rural populations and help them economically in order to help level out rural/urban disparities. Moreover, substantial upfront costs and long-term financial investments are required to accelerate the pace of rural electrification. Such financial security depends on government support.

Efficient implementation of rural electrification programmes often needs regulations and market reforms, including market incentives through increased competition for private involvement and above all government involvement. Moreover, technical standards and norms can lead to an oversizing or costly infrastructure set-up for the electrification of rural households or villages, which will increase connection costs and the price of electricity. A reassessment of these standards and norms at the government level may prove necessary to alleviate the unnecessary additional financial burden from the electrification effort in rural areas.

Technologies Used in Rural Electrification Projects.

Globally, the problem of providing modern energy services to rural areas have been addressed by two major strategies: grid extension to electricity services in the urban centres and deploying of Renewable Energy Technologies to meet the needs of the rural population. The choice of a specific energy technology for rural electrification naturally depends on the targetedcountry and on whether it is a whole region, community, business, farm or household that is to benefitfrom the process. But this is not the only concern. Issues of customer and load density, relative distanceto the national or regional grid, landscape, availability of natural resources such as wind, sun, water, forests, economic and financial aspects, availability and maturity of any chosen technology, all these factors influence the decision maker in his choice of the technology or technology mix. The pool of potential energy technologies for rural electrification programmes is quite large and each technology naturally varies in its generation technique, its costs, and in the quality of the service it delivers. Depending in part on the degree of urbanization of the targeted population, energy technologies used in electrification programmes generally involve national or regional grid extension, diesel generators, liquefied petroleum gas (LPG), disposable batteries, kerosene lamps, renewable energies (including photovoltaic systems, wind energy, hydropower, and new wave energy and hydrogen) or hybrid systems.

The Nigerian Rural Electrification (RE) Policy and Programme

Historical Overview of RE Policies in Nigeria

In 1981, the Federal Government of Nigeria initiated the Rural Electrification Programme with the primary objective of connecting all existing local government headquarters in the country to the national grid. By connecting the headquarters, several small towns and communities between them will benefit from the programme, and ultimately bring power to the vast majority of rural dwellers. The defunct National Electric Power Authority (NEPA) was mandated to execute the programme on behalf of the Federal Government. Due to political patronage, procurement problems and poor funding, progress was slow and came at high financial costs. In 1989, the programme was restructured according to geographical accessibility to grid connecting points and facilities and a common procurement of offshore components and the federal government inaugurated an Implementation Committee on Rural Electrification (ICRE), comprised of officials from NEPA, the Federal Ministry of Power & Steel, and the Electrical Inspectorate Services Department. RE projects were monitored by the 15 zonal offices of the Ministry, and NEPA's RE Department handled project supervision and evaluation. Despite the partnership between local communities, state governments and the federal government on this programme, progress was painfully slow. Again, political interference, poor funding, planning and mismanagement of the overall electricity sector impeded growth in national access rates. Between 1989 and 1999, a period of ten years, only about 300 projects were completed and connected to the national grid and a total of 800 projects were abandoned by the outgoing military regime for the incoming civilian administration in May, 1999. With renewed commitment and political will between 1999 and 2001, additional 189 projects were completed and by the end of 2003, over 600 local government headquarters out of the 774 headquarters were connected to the national grid.

However, in view of the critical nature of electricity to overall national development, the rural electrification programme was ripe for reform. The reform of the RE sector was anchored on a broader power sector reform and restructuring process. The reform of the sector was thus captured in the Electric Power Sector Reform Act (EPSRA) of 2005 part IX sub section 88 – 90. The EPSRA created the Rural Electrification Agency (REA) as the main government agency to drive RE in Nigeria. The Act provided for funding for the entire electricity sector and including funding for the rural electrification programme.

Also, in 2003 the Federal Executive Council (FEC) approved an overall National Energy Policy (NEP), which articulates for the use of all viable energy sources for sustainable national development and with the active participation of the private sector in line with government's economic policy. The NEP has amongst other things, five broad objectives, which includes the provision of electricity to the rural dwellers. The broad objectives of the NEP are:

1. To enhance energy security in the nation through diversifying the energy supply mix.
2. To increase energy access especially in the rural and semi – urban areas;
3. To facilitate employment creation and empowerment; and
4. To protect the environment and mitigate climate change.
5. To build local capacity.

Deployment of Renewable Energy Technology (RET) in Nigeria

In 2005, the Energy Commission of Nigeria (ECN) produced the Renewable Energy master Plan (REMP) as a roadmap for the planned implementation of the renewable energy component of the NEP. The REMP is basically structured into the following programmes with short, medium and long term targets. The programmes are:National Biomass energy Programme; National Solar Energy Programme; National hydropower Programme; National Wind Energy Programme; Emerging Energy Programme and Framework Programme for Renewable Energy Promotion. Based on a 13.5% GDP growth rate, the REMP projects the contribution of renewables to the electricity supply for the country (Table 1).

Table 1: Summary of Renewable Energy Targets for Electricity Supply (MW)

S/N	RESOURCES	SHORT	MEDIUM	LONG
1.	Hydro (large)	4,000	9,000	11,250
2.	Hydro (small)	100	760	3,500
3.	Solar PV	300	4,000	30,005
4.	Solar Thermal	300	2,005	10,000
5.	Biomass	5	30	100
6.	Wind	23	40	50
All renewables		4,628	15,835	54,905
All Energy Resources		21,238	85,668	270,068
% of Renewables		22%	18%	20%

Note: short – 2015; Medium – 2020 and Long – 2030

Also, in 2006, the International Centre for Energy, Environment and Development (ICEED) prepared a renewable electricity policy for the Federal Ministry of Power These enabling policy provisions provided the impetus for the Federal Ministry of Power and Steel to embark on the development of National Policy Guideline for Renewable Electricity and Renewable Electricity Action Program. This document pertains to the National Policy Guidelines on Renewable Electricity. The overall objective of this Policy Guideline is to expand the role of renewable electricity in sustainable development through effective promotional and regulatory instruments. The policy guideline also seeks to increase access to electricity services nationwide, especially in rural areas.

Institutions and Agencies Involved in Rural Electrification in Nigeria

Currently the following institutions and agencies are involved in the deployment of rural electrification in Nigeria. They are: Rural Electrification Agency (REA); Energy Commission of Nigeria (ECN) and the National Agency for Science and Engineering Infrastructure (NASENI).

Rural Electrification Agency (REA)

The Rural Electrification Agency (REA) was established in 2006, via section 88 (1) of the Electric Power Sector Reform (EPSR) Act, of 2005. The act established the Electrification Agency and the Rural Electrification fund. REA adopted the following three methods in providing electricity service. These are: Expansion of the main grid to rural areas; Development of Isolated and Mini-grid systems and Renewable Energy generation.

REA commenced operations in August 2006, with all its projects centered on grid expansion to rural areas, via funding from the Federal Government annual budgetary allocation. The Rural Electrification Fund was entrusted to a Fund Trustee. Approximately 2,000 grid expansion projects at various level of completion were taken over by the Agency from the Federal Ministry of Power's National Rural Electrification program. New grid expansion projects were initiated by the REA between 2008 and 2009. Currently, the agency has a total of 1,964 Distribution Expansion Projects at various stages of completion. Figures 1 – 6 shows the distribution of these ongoing projects in various states of the country. The agency also intends to use renewable energy as part of the electricity supply mix to remote off-grid communities (capturing the uncompleted REA projects) in Nigeria in a sustainable and commercially viable manner. These communities are typically found in:

1. The coastal areas of the Niger-Delta
2. The highlands of the South-West, up the border with the Republic of Benin
3. The mountainous regions of the South-East, up to the border with Cameroun
4. The far North-East and far North-West, up to the border with Niger Republic

Particularly the agency is interested in developing market incentives for the deployment of efficient private sector driven solutions. While the Federal Government, will provide the enabling environment and support for the successful deployment of renewables in remote areas. Also, the agency seeks to leverage on the capabilities of the private sector, for technical appraisal, engineering design, project management and delivery of projects. There are various programme delivery models contemplated, i.e. under a B.O.O. (Build, Own, and Operate) basis and other potential public private partnerships (PPP).

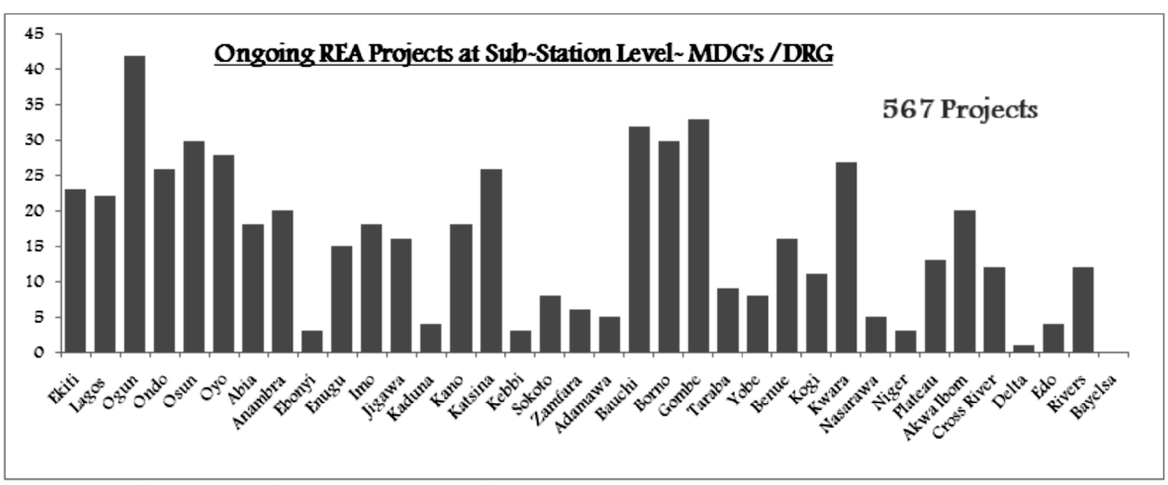

Figure 1: Ongoing REA projects at Sub – station levels

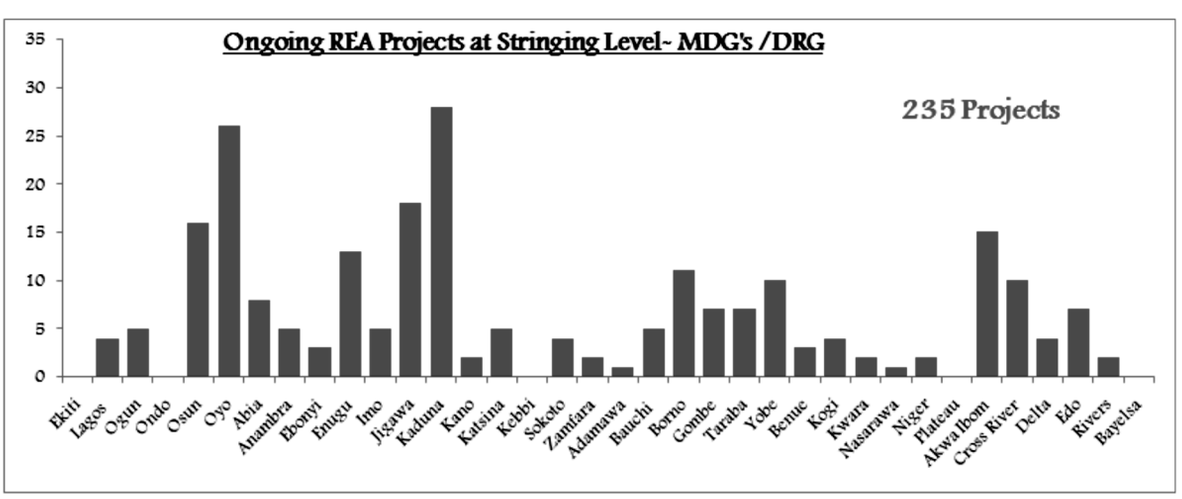

Figure 2: Ongoing REA projects at stringing Levels

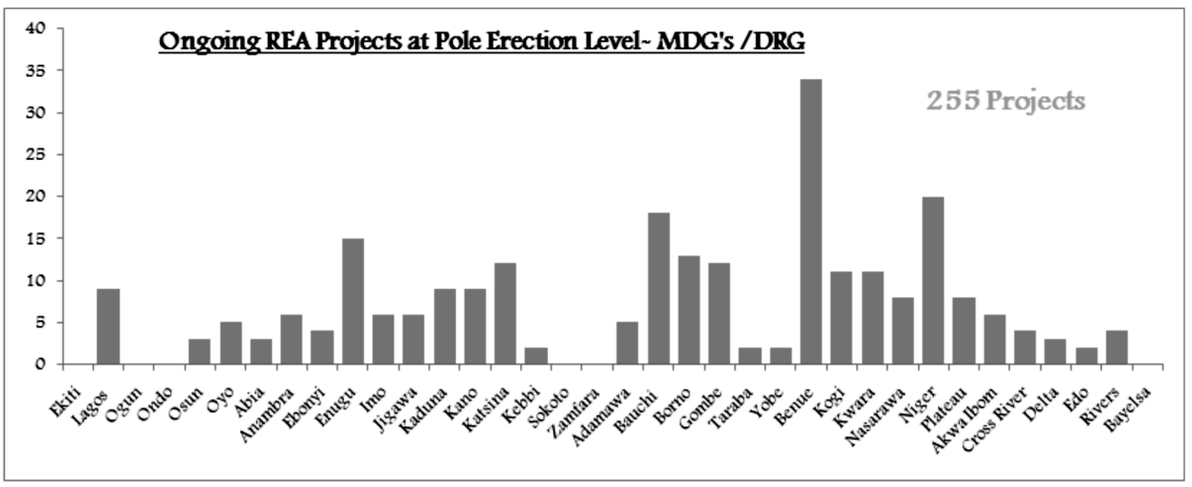

Figure 3: Ongoing REA projects at Pole erection Level

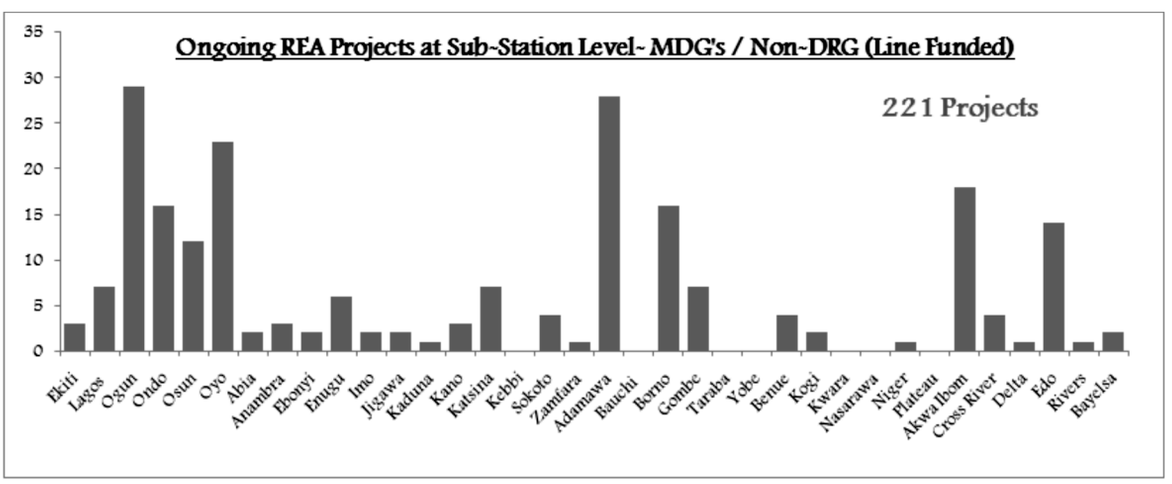

Figure 4: Ongoing REA Projects at Sub – Station Levels- MDGs

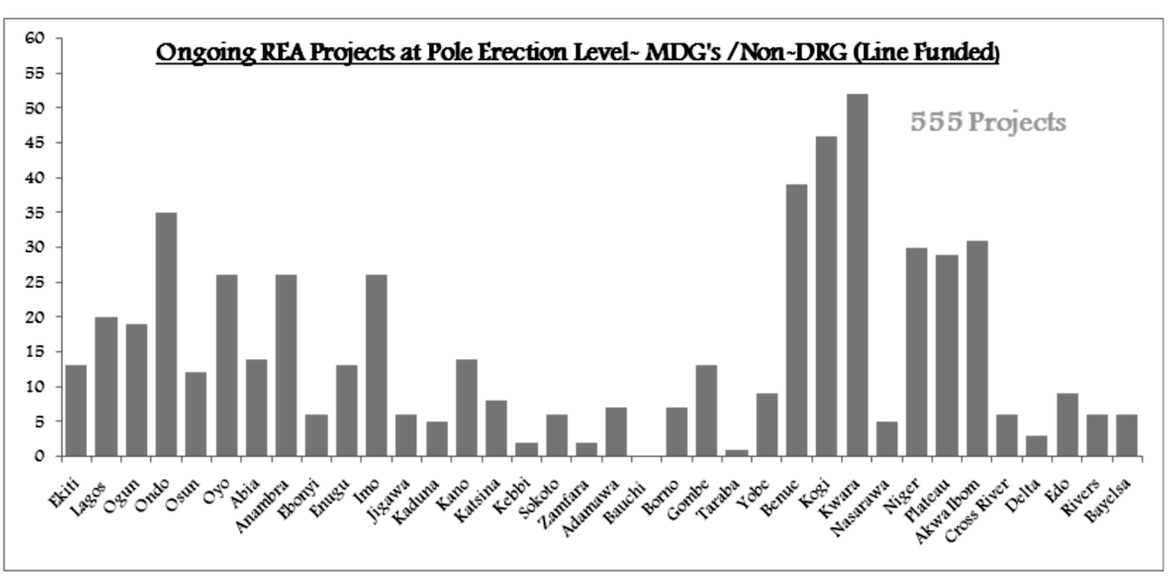

Figure 5: Ongoing REA projects at Pole Erection Level

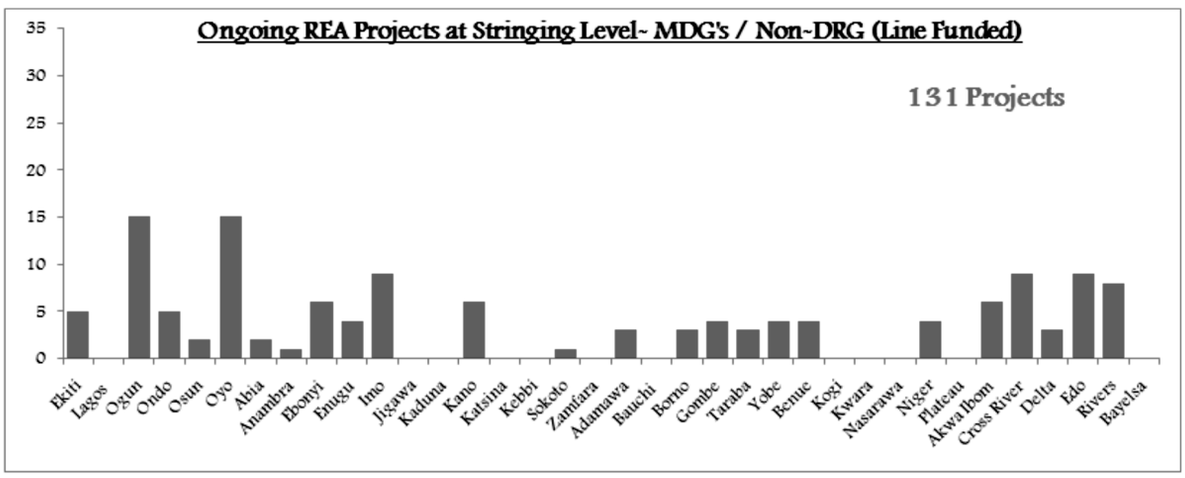

Figure 6: ongoing Project Stringing levels

Energy Commission of Nigeria

The Energy Commission of Nigeria (ECN) is the major institution that has been promoting the development of renewable energy technology, rural energy and electricity deployment in Nigeria. The ECN was established by Act No. 62 of 1979, as amended by Act No. 32 of 1988 and Act No. 19 of 1989, with the statutory mandate for the strategic planning and co-ordination of national policies in the field of energy in all its ramifications. By this mandate, the Commission which is the apex government organ is empowered to carry out overall energy sector planning and policy co-ordination. The ECN carries out its mandate through various energy centres that were established across the nation

The Renewable energy projects which are currently being coordinated by ECN for rural electrification include

Hydropower

I. 30MW Gurara I hydropower plant completed and power evacuation network being put in place (FMP).
II. 40MW hydropower plant across river Katsina Ala in Taraba state, 55% execution to be completed by 2014 (FMP)
III. 2x75kW Waya Dam SHP in Bauchi completed(UNIDO, ECN, RBDA &Bauchi state)
IV. 1x30kW Ezioha – Mboro Dam SHP, Enugu completed(UNIDO, ECN, RBDA)
V. 2x200kW Tunga Dam SHP, Taraba State – Machines on site (UNIDO).
VI. 34MW DadinKowa Dam, Gombe State, Hyropower plant concessioned to private sector but yet to commence operation.

Wind

I. Electronic Wind Map (WIS) development for wind resources assessment (FMST, ECN, FMP).
II. 10MW Wind farm in LambarRimi Katsina – Contract awarded in 2009 & to be completed 2013(FMP)
III. 2x215kW wind turbines at UDUS by SERC(ECN).
IV. 70x3kW wind turbines in Zamfara State by the State Government

Solar Energy

I. Solar street lights, water pumping systems, mini-grids, solar refrigerators etc.- about 15MW dispersed installations in the country (ECN, State Govts, MDG office, FMW, NPI, JICA, NGOs,& MDAs)

II. 7.5MW solar PV modules manufacturing plant, Karshi, Abuja (NASENI, FMST)
III. 500kW solar PV plant in Katsina (JICA & FMP)
IV. 30MW solar PV plants in Katsina, Gombe and Bauchi by German-Nigeria energy partnership
V. 50kW solar PV plant in Kaduna (FMEnv& Private sector)
VI. 20 MW solar PV plant in Yola (Nigeria- German energy partnership)
VII. Solar water heaters, cookers, dryers, distillers etc.(R&D outputs)

Biomass

I. 5MW rice husk fired power plant in Ebonyi state – feasibility completed (UNIDO, Ebonyi state Govt).
II. Biogas digesters @ R&D stages

National Agency for Science and Engineering Infrastructure (NASENI)

The National Agency for Science and Engineering Infrastructure (NASENI) was established in 1992 by The Federal Government of Nigeria. The Nigerian Ministry for Science and Technology is responsible for overseeing the activities of NASENI. NASENI, by its mandate and scope of operation is the Nigerian all-purpose built Agency designed to conduct developmental work in the areas of manufacturing and as such, it is capable of coordinating the proliferation of technologies developed either within or outside of its Centers including patents obtained. Technologies developed in the areas of spares, components and systems engineering are to be transferred to Entrepreneurs for the production of goods and services. NASENI operates mainly through her Development Institutes. Each of the Institutes has a unique mandate of engineering infrastructural development. The major institute associated with the power sector and by extension rural electricity development is Power Equipment and Electrical Machines Development Institute (PEEMADI), Okene. The institute is currently involved in the development and manufacture of machines to manufacture power equipments and electrical machines in renewable energy technologies in the areas of small hydro power that will serve the rural electrification programme, and wind energy programme.

Under the small hydropower project, the agency has selected ten (10) sites in the six geopolitical zones of the country and the Federal Capital Territory (FCT) to implement the first phase of the projects (Table 2). With regards to the wind project, the agency is in the process of developing capacity for the aerodynamic design, fabrication and installation of wind turbine blade that can give optimum performance in our vast but low wind speed region with long durational harvest specifically for electricity generation in rural areas.

Table 2: Selected Sites for Small Hydropower Development in Nigeria

S/N	Site/Community	State/Geo– Political Zone	Capacity (kW)
1.	Ketti	AMAC/FCT	10 KW
2.	Kwaita	KWALI/FCT	10 kW
3.	KurmuDaudu	BWARI/FCT	10 kW
4.	Eboji	ABAJI/FCT	10 kW
5.	Obudu Cattle Resort	Cross River/South– South	30 kW
6.	Ta Hoss community	Plateau/North– central	100 kW
7.	Ikeji – Iieijesha	Osun /South– west	15 kW
8.	Iguoriakhi Farm Settlement	Edo/South–South	75 kW
9.	Sabke – Mai idua	Katsina/North- West	150 kW
10.	Kiri– Numan	Adamawa/North- East	300 kW

Challenges of Rural Electricity Access in Nigeria

The challenges in delivering rural electricity in Nigeria are quite numerous and daunting. These include the following:

1. Affordability

The ability to pay for improved energy services in rural areas is a major challenge, given that majority of the population is predominantly engaged in peasant agriculture and allied activities and their income streams are often seasonal and not steady throughout the year. They are also largely income and energy poor.

2. Financing

Designing and implementing sustainable rural energy finance face significant challenges because of the greater risks and lower affordability of majority of rural population. Mobilizing financial resources to expand rural electricity service delivery is essential to a sustainable energy and economic future in Nigeria. In this context, Public Private Partnerships (PPPs) provide an important mechanism to overcome government budgetary constraints for widening rural access to energy services.

3. **Viable Business Model**

A number of examples have shown that even when the technology is viable, the success of a renewable energy based rural electrification programme could be hindered by inadequate effort to create and demonstrate a viable model for further diffusion or the necessary structure for maintenance, financing and continued operation (Martinot et al., 2002). There is need to evolve viable business model to guarantee the sustainability of the rural electrification programme in Nigeria.

4. Community ownership, capacity building and training

One of the major limitations of several energy access projects (in particular electrification projects) has been the lack of community involvement in the operations and management as it requires time and information in education, training and trust-building of the communities (Valencia and Caspary, 2008). Even when they are involved for day-to-day operations and management, lack of capacity building and proper training inhibits the projects to have a substantive impact. However, there is now a realization that community buy- in and their active involvement right from the planning stage is pivotal to ensure the success of any project. This is a major challenge in Nigeria.

5. Institutional Arrangements

Another significant challenge encountered in several energy access projects is the absence of robust institutional mechanisms (Barnes 2005; Aldover, 2007). There are several institutional shortcomings in delivering the energy services to remote locations in Nigeria. Rural energy access and rural energy development in most developing countries does not have any specific institutional support. Rural energy access programs are usually managed by energy supply-focused government institutions, but energy access is also a demand side issue. Both supply and demand side issues should be incorporated in the institutional framework for delivering universal rural electricity access in Nigeria.

6. Policy Inconsistency and Legislative Constraints

Frequent changes in the government have resulted in changes in programs and policies, thus leading to lack of continuity in policies and programmes. Yet, the fact remains that the issue of sustainable access to energy,

and in particular electricity, cannot be totally handled or achieved within the lifespan of one government. Furthermore, the extension of energy to remote rural areas requires enormous capital both human and financial, which might be above what a single government budget could support. Consequently, policy inconsistency often linked to changes in government remains one of the greatest hurdles militating against the achievement of affordable and sustainable energy in Nigeria. Closely linked to the problem of policy inconsistency is the issue of delays by the national assembly in the passage of critical legislative submissions which also in most cases create uncertainty in major projects.

7. Crisis, conflict and insecurity.

Another major challenge that may hinder the success of the provision of affordable and sustainable energy for all is the problem of conflict, and insecurity, especially the unrest in the Niger Delta region and the Boko Haram in the north. The ineffective communication system also hinders the prompt report of the activities of hoodlums that vandalize power supply facilities particularly in remote rural areas.

8. Inappropriate Transmission System

Nigeria has several electricity transmission substations located over the entire 923768km areas that makes up Nigeria. The primary distribution networks emanate from theses substations. However, the sub-transmission scheme in the country is mostly radial, thus providing a single power flow route to consumers. This predominantly radial configuration of transmission lines engendered disturbances which can lead to system collapse when there is any slight change in the operating point of any of the major plants (Omoigui and Komolafe, 2000). They also observed that the enormous size of the nation necessitated the transmission of lines across several kilometres, sometimes stretching over swamp, wide rivers and thick forests, all of which constitute hidden and real hazards that can interrupt the smooth transmission of electricity to the consumers. In addition, the enormous rural- urban migration in Nigeria have suddenly converted some residential areas into commercial centres, leading to serious overloading of the existing power supply and thereby reducing the efficiency and adequacy of the power transmission. Overloading of the transmission and distribution system is a major characteristic of the current power system in Nigeria.

The Prospects of Improved Rural Electricity Access in Nigeria

From the discussion above, the investment in capacity expansion and operations in the electricity industry in Nigeria needed to achieve universal rural electricity access face enormous challenges. These challenges towards achieving universal rural electricity access in Nigeria are multidimensional. They are not just financial or technological, much more, it is to properly balance the multidimensional nature of the issues that include economic, political, technological, institutional and environmental factors as well as how to leverage partnerships among of the principal actors involved in the activity namely, consumers, producers, investors and the government.

One of the basic factors in securing the energy future is the energy mix over the next several decades. There are significant fossil fuel and alternative renewable energy resources, consisting of large and small scale hydro, solar, wind, geothermal and bio-fuel potentials. The abundance of primary energy resources compared to the energy needs of the Nation's economy and society is incontrovertible. While both energy resources will be used in the future, the continued dominance of fossil fuels supplemented by hydroelectricity is envisaged for the foreseeable future. Coal, hydro, solar, biomass, wind and nuclear energy technologies are alternative electricity generation options under consideration.

However, developing and deploying cleaner energy should be part of the medium term investment strategy. The focus however should be how to progressively adopt cleaner fossil fuels with increasing focus on renewable energy sources to meet rural electricity demand.

Conclusion

The study has critical examined the challenges and constraints confronting the provision of universal rural energy access in Nigeria. The study clarified the concept of rural areas and highlighted some of the conceptual and operational issues in the planning and execution of rural electrification programmes globally. The study also gave a historical perspective of the rural electrification programme in Nigeria, the policy, institutions and agencies involved in the implementation of the programme in the country and showed the inadequate effort made so far by various agencies of the Nigerian government to provide rural electricity access and modern energy. The study also enumerated the prospects of improved universal rural electrification in Nigeria.

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