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# Nigeria's energy policy: Inferences, analysis and legal ethics toward RE development



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## HIGHLIGHTS

- The study exposed the energy policy issues of Nigeria.
- The various policy documents and the energy statement of vision 20:2020 were surveyed.
- Various challenges impinging growth or renewable energy were highlighted.
- Some suggestions for policy reformation were proposed.

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## ABSTRACT

The study critically assessed the various policy issues of sustainable energy development in Nigeria. The basic focus was to discuss and analyze some of the laws of the federation as it relates to the development of Renewable Energy in Nigeria. It surveyed the nation's energy policy statement and the vision 20:2020 of the federal government. The Renewable Energy Master Plan developed by the joint efforts of the Energy Commission of Nigeria and United Nations Development Programs were also appraised. The level of development and the index of renewable energy production as stated by the policy statement, the vision 20:2020 and the Renewable Energy Master Plan were highlighted. The study found some policy challenges which include weak government motivation, lack of economic incentives, multiple taxations, non-existent favorable customs and excise duty act to promote renewable energy technologies. Further to this, some legal reforms which may aid the promotion of renewable energy development in Nigeria and also make robust the nation's energy policy were proposed. Some of the laws that require amendment to promote renewable energy include the land use act, environmental impact assessment decree and the investment laws of the federation of Nigeria.

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## 1. Introduction

Energy has been defined as the ability to do work (Tippens, 2001). It is a force multiplier that enhances man's ability to convert raw materials to finished and usable goods (Ajayi and Ajanaku, 2009). The interdependence between energy availability, its supply, demand and utilization is one of the factors that control national development vis-à-vis population explosion and/or rural–urban integration (Hermann, 2001; Ajayi et al., 2011a). Based on this, efforts are always geared toward seeking ways of producing sufficient energy for the populace. Such ways include those that produce from modules that are both sustainable and efficient.

However, two sources of energy production exist. These are the renewable and non-renewable energy sources. The most commonly employed of these have been the non-renewable sources of nuclear and fossil fuels origin.

The utilization of non-renewable energy sources proved to be adequate but the byproducts are deleterious to humans and the environment. Sustainable electricity production is however hinged on employing the Renewable Energy (RE) sources. These include small and large scale hydropower, wind, solar, geothermal and biomass. The sources are found to be environment friendly, readily available and easily applicable. In addition to this, various international debates on sustainable development have favoured energy production from renewable sources. Many international and regional declarations also favoured increasing generation from RE sources. For instance, the European Union ratified the Kyoto protocol in her framework accord of eliminating greenhouse gas emission level of 1990 by 20%. It desired to make renewable

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energy account for this fraction of total energy consumption by the year 2020. Further to this, the United States of America (USA) has also intensified efforts at increasing generation from renewable sources. The country increased the installed wind power capacity from 2472.478 MW in 1999 to 40,266.96 MW in 2010. China, a country widely acclaimed to be a very high emitter of anthropogenic carbon dioxide (Chandler et al., 2002; Leggett et al., 2008; Wen, 2009; International Energy Agency (IEA), 2011) has also increased efforts of wind-to-electricity generation. Her installed capacity of 4.0 MW in 1990 went up to 567 MW in 2003. By 2010, she was reported to have the World's largest installed capacity and this is projected to reach 20 GW by 2020 (National Renewable Energy Laboratory (NREL), 2004). Fig. 1 presents the progression of installed wind power capacity in the USA while Fig. 2 presents that for the world. It is worthy of note however that Figs. 1 and 2 demonstrate a nonlinear or exponential growth in installed capacity. These reveal a rapid rate of growth. Despite this rapid growth in world installed capacity, no country in the West African region has input and only Kenya has made progress in Africa. On the African continent, only four countries generated electricity from geothermal, solar and wind sources in 2003. These countries include Kenya and Egypt with 0.3 GWh each, and, Morocco and South Africa with 0.2 GWh each. This therefore signifies a long way for sustainable energy development in Africa.

In the case of Nigeria, energy production, supply and demand has been through challenging past. The national power utility has not been able to produce sufficient power for Nigerians and the supply–demand imbalance has tilted in a way that favours and promotes self-production through the use of fossil fuels and traditional biomass. Citizens in the rural areas have been worst hit. They mostly depend on fuel wood for energy and this encourages deforestation. Most rural communities are not connected to the national grid and the rural access of electricity is reported to be 26% in 2008 (UNDP–WHO, 2009). Today, this

statistics has not improved. The government needs to embark on grid extension program to rural areas to create an improvement. On a national scale, electricity access is put around 50–60% of the total population (EIA, 2007; UNDP–WHO, 2009). This invariably suggests the need for more effort by both governments and private sectors. The low availability of electricity and its reliability in the urban communities has not aided business development.

Moreover, the government, in a bid to improve the energy state of Nigeria, has recently taken steps to increase generation capacities to boost electricity production. However, the steps taken are in the direction of increasing thermal power generation. There are also intentions to extend the hydropower generation sources in the later future. Despite these, as long as the majority of the rural areas are not connected to the national grid, only the urban dwellers will benefit. Improving the nation's energy supply requires not only increasing generation capacities but also grid extension and diversification of energy frontiers. This will mean to extend the nation's energy sources to include the renewable energy resources of solar, wind and biomass for power generation. The RE sources has opportunities to be utilized as standalone for community utilization and also for grid connection. This suggests that rural electrification can be achieved by employing RE resources. It can also be used to boost national energy production when employed in areas with huge resource potentials. Notwithstanding, countries that promotes generation from RE resources are reported to have robust renewable energy policies.

In addition to the efforts of the government of Nigeria at improving the condition of energy in the country, it has also developed the national energy policy and the vision 20:2020. These policy documents contain the intentions of the government at improving the state of energy in Nigeria.

## 2. Nigeria's energy policy and the issues of sustainable energy development in Nigeria

The Nigeria energy policy document came to effect in 2003 to serve as a road map to a better national energy future. Based on this policy statement, the Renewable Energy Master Plan (REMP) was developed in 2005 (Energy Commission of Nigeria and United Nations Development Programme (ECN–UNDP), 2005). REMP document is the product of the efforts of a group of consultants organized by the Energy Commission of Nigeria (ECN) in collaboration with the United Nation Development Programme (UNDP). The mandate was to look into the energy situation of the country and proffer solutions that will enhance the energy policy. In addition to this, the vision 20:2020 agenda of the federal government also contains an energy statement in support of the policy. The vision 20:2020 agenda was released in 2009 (Vision 2020 National Technical Working Group (VNTWG), 2009). It contains the ideology of the government at improving the economy from the present Gross Domestic Product growth rate of less than 10–13%.

The energy policy contains nine (9) key objectives among which are (VNTWG, 2009) as follows:

- “To ensure the development of the nation's energy resources, with a diversified energy resources option, for the achievement of national energy security and an efficient delivery system with an optional energy resource mix”.
- “To generate adequate, reliable and sustainable supply of energy at appropriate costs and in an environmentally friendly manner, to the various sectors of the economy, for national development”.
- “To successfully use the nation's abundant energy resources to promote international cooperation”.

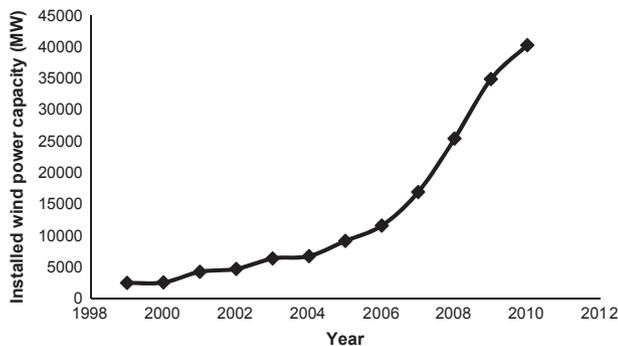


Fig. 1. Progression of new installed wind power capacity in the USA.

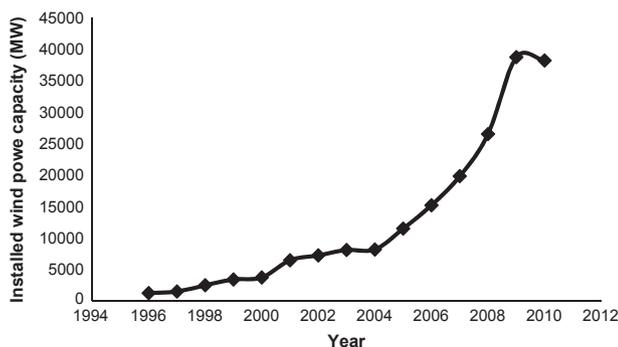


Fig. 2. Global progression of new installed wind capacity (CleanTechnica, 2012).

Further to this, the energy statement of the Vision 20:2020 is broadly focused on the target of “meeting the demand for energy in all sectors of the economy including households, with safe, clean and convenient energy at an affordable cost” and also in a manner that is “technically efficient, economically viable and environmentally sustainable through applications of conventional and non-conventional energy sources” (VNTWG, 2009). The vision statement specifies that, “By 2020, the energy sector will be the major engine of the nation’s sustainable social, economic and industrial growth, delivering affordable and constant energy supply efficiently to other sectors of the economy” (VNTWG, 2009). In addition, REMP proposed a road map to translate the policy into implementable projects, activities and programs by stipulating that the country should endeavor to increase the energy generation capacity from 5000 MW to 16,000 MW by 2015 through the exploration of renewable energy resources (ECN–UNDP, 2005). It envisaged that the trend of demand should follow the progression of Fig. 3, while the combined contributions of wind and small scale hydro should follow the representation of Fig. 4.

Fig. 3 demonstrates that the demand curve for conventional sources should move from 7000 MW to 29,000 MW, between 2007 and 2025 while that for other RE should be from marginal to 2900 MW. The envisaged constituents of the RE are the small scale hydro, solar photovoltaic and solar thermal, biomass and wind. Fig. 4 on the other hand shows that, the energy additions from wind and small scale hydro should grow from 1 MW to 38 MW and 56 MW to 2000 MW respectively.

Considering the aforementioned, it is clear that the government intends to generate electricity from RE resources. Nonetheless, most important is the question as to how the policy has led to sustainable energy development and power generation. Another is to know the extent the policy and vision statement deliver on promoting grid electricity from the highlighted RE

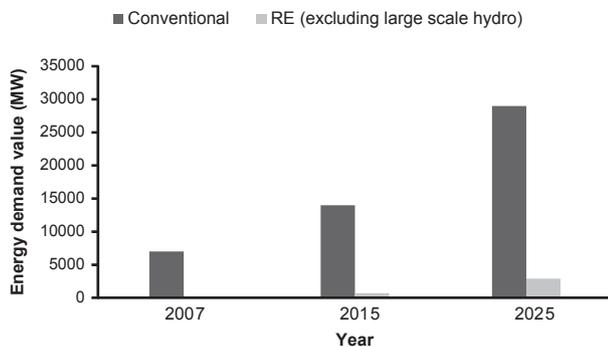


Fig. 3. Demand of energy from conventional sources (fossil fuels and large scale hydro) and other RE sources.

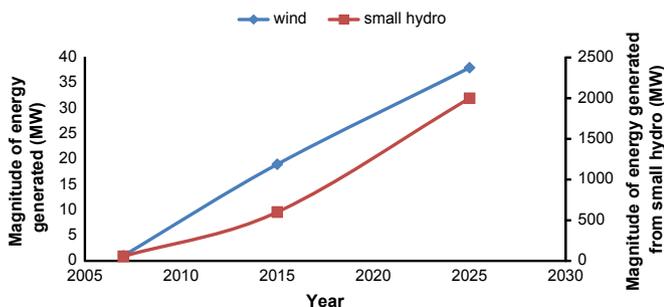


Fig. 4. Combined contributions of wind and small hydropower productions to productions from conventional sources.

sources. Despite the targets marked out in the plan, the nation is yet to generate grid electricity from wind, solar, or biomass. Some states have begun utilizing solar energy for street lighting and the Lagos state government is looking to build capacity for biogas generation from landfills wastes.

Further to this, although there are identified potentials for wind power utilization in Nigeria, especially in the northern parts of the country (Ajayi et al., 2011a; Fagbenle et al., 2011), there is still no grid electricity from wind. There is also no community powered by standalone wind turbines. Eight years to the target year of the vision statement, the nation is yet to experience sustainable energy production from wind, solar or biomass on a large scale. The efforts have only been toward promoting generation from fossil fuels based power plants. Worth noting is the fact that, the policy regarding RE development and the issues raised in REMP have not yet begun implementation. Although the REMP document was the result of the initiatives of a government parastatal in collaboration with UNDP, it is yet to be passed into law.

Regardless of the fact that the government’s desire and are willing to implement the policy statements, they cannot single handedly carryout the implementation to an enviable level. Collaboration with the private sector cannot be overemphasized. Moreover to promote and encourage private partnership, some policy issues that discourage the growth of RE development must be addressed and strategies put in place to further its development.

### 3. Hindrances to RE policy implementation

Going through the various policy statements on RE development and utilization, there are certain issues which may be addressed to further the development and also accelerate the growth of RE in Nigeria. These policy issues when properly implemented may attract investors into Nigeria. Some of the hindrances to the policy implementation include the following.

#### 3.1. Weak government motivation

The policy statements and the documented intentions are clear evidence of the government to generate electricity from RE resources. These documents contain road maps and target dates of implementation. On a short term analysis, how has the government been able to meet with the challenges. The government may need to do more to actualize the intentions. This may require releasing sufficient resources and setting up implementation committees to oversee the establishment of renewable energy projects across the country. The government has made efforts to increase generation capacities from fossil fuels power plants. They may also need to focus more on RE development when consideration is given to the target dates. Recently however, the government began to commit funds to renewable energy projects. For instance between 2011 and 2013, the federal government has approved budget proposals to fund renewable energy projects. These projects are three in number. Fig. 5 shows the value of budget proposal for each project per year and the total approved budget proposals for all the renewable energy projects in the last 3 years. The figure shows that approved budget proposals for renewable energy projects for the period ranged from about 0.097–2.74 billion naira (N) (US\$617,000–17.6 million) for electricity from biomass and biogas. It is also between 250 million and 1.14 billion naira (i.e. US\$1.6 and 7.2 million) for the 10 MW wind farm project. For small and medium hydropower, the budget proposal was between 2.2 and 2.5 billion naira (i.e. US\$14 and 16 million). The hydropower projects are located in nine states (Gombe, Kaduna, Kano, Katsina, Ondo, Ogun, Oyo, Sokoto, and Zamfara). The total

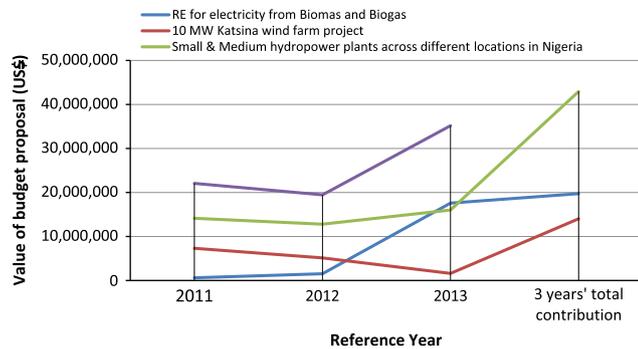


Fig. 5. The annual value of approved budget proposals between 2011 and 2013 for RE energy projects in Nigeria (Federal Government of Nigeria (FGN) Budget, 2011, 2012, 2013).

capacity of the hydropower projects is given as 150 MW. The cumulative total monies budgeted per year amounts to about US \$22, 19.5 and 35.2 million for the years 2011, 2012 and 2013 respectively.

These funds are minimal and the motivation needs to be improved if the target of generating 600 MW of small hydro and 19 MW of wind power by 2015 (Fig. 4) must be achieved.

In addition to the aforementioned, recent reports of wind power assessments for different sites in Nigeria at 10 m height demonstrate that huge potential exists for wind power generation especially in the north (Ajayi, 2009; Ajayi et al., 2011a, 2011b, 2011c; Fagbenle et al., 2011; Ohunakin et al., 2011). For instance, Ajayi et al. (2011a) reported the potential of average monthly wind speed magnitude at a 10 m height of between 6.7 and 11.8 m/s at a site in Jos. Ajayi et al. (2011b) also reported the potential of average monthly wind speed magnitudes between 1.7 and 15.2 m/s at a site in Gusau, with 80% of the data between 5 m/s and 10 m/s. Also, the potential of wind power generation at average speeds between 3.9 m/s and 5.9 m/s, and between 4.4 m/s and 6.3 m/s exists at a site in Potiskum and Maiduguri respectively (Fagbenle et al., 2011). Other reports also exist for sites in other states of the federation (Fadare, 2010; Ajayi et al., 2011d), each showing very good potential for wind power generation. Based on this, the policy's projected wind energy generation target does not represent the huge potential of wind power potential of the country. More so, REMP demonstrates that the nation has tremendous untapped potentials for small and medium hydropower projects scattered across the country. The government may therefore need to up the projected generation targets to reflect the country's potential capacity and also develop more wind farms. Also more funds will be required to pursue vigorously the aspiration of generation from RE.

### 3.2. Lack of economic incentives

The energy policy document and especially the REMP document contain road maps to translate the policy into implementable projects, activities and programs (ECN-UNDP, 2005). It however lacks the selling point. This is the part of a policy that is attractive to investors. What incentives are in place for RE marketers and how the government intends to aid or support willing investors should be clear. The government needs to develop incentives such as tax holidays for RE investors, provide low or interest free loans to aid RE technology investment, develop appropriate feed-in tariff for grid connected renewable electricity, legalize the right to connect renewable electricity to the national grid, and the obligations for national electric utility to purchase RE (Ajayi, 2010).

### 3.3. Multiple taxations

In Nigeria, the occurrence of multiple taxations can be a hindrance to business development. Tax payment to federal, state and local governments can be harmonized and made payable at once through a central collecting organization. Such payments should also be minimal to the extent that could aid interests and return on investments. Tax chargeable on renewable energy projects should not be on the same rating as those from conventional sources. The value added tax and other tax payable by both consumers and marketers should be such that would aid the adoption and utilization of RE technology, especially wind and solar.

### 3.4. Non-existent favorable customs and excise duty act to promote renewable energy technologies

Presently the customs and excise duty act of Nigeria lacks aspects that could aid easy importation of RE technology and equipments. To aid RE development and attract foreign investors, the government may need to look into the customs and excise duty act with the aim of creating sections that will be RE-specific. By doing so will make the revenue generation from RE technology imports be at variance from other imported goods. Marking RE technology imports as "special" for duty free or subsidized duty will encourage investors to import technologies to promote renewable energy development.

## 4. Some existing legislations that can facilitate the adoption and growth of renewable energy in Nigeria

In a bid to attract and encourage investment in renewable energy in Nigeria, especially wind energy technology development, the government needs to put in place the necessary mechanisms that will aid renewable energy development and production in Nigeria. One of the challenges of this effort is the absence of a legal framework to regulate the industry. However, there are some existing laws that have provisions that can be adopted to facilitate the growth of the RE industry. These laws, if adopted, will need slight adjustment in the form of a review to include aspects that specifically favor RE development in the country. Such laws include the Land Use Act Cap 202, Laws of the Federation of Nigeria 1990, the Environmental Impact Assessment Decree, No. 86, Laws of the Federation (1992) and some other relevant provisions discussed below.

### 4.1. Land Use Act Cap 202, Laws of the Federation of Nigeria 1990

In attracting investors to realize the renewable energy master plan, the availability of land is of extreme importance. Section 1 of the Land Use Act provides "Subject to the provision of this act, all land comprised in the territories in each state in the federation are hereby vested in the Governor of that State and such land shall be held in trust and administered for the use and common benefit of all Nigerians in accordance with the provisions of this Act".

Section 2(1) of the Land Use Act provides as from the commencement of this Act:

- All land in urban areas shall be under the control and management of the Governor of each State,
- All other land shall, subject to this Act, be under the control and management of the Local Government, within the area of jurisdiction of which the land is situated.

The provisions of Sections 1 and 2 make it clear that land is held in trust for the citizens by the governor and the local authorities. As desirable as the provisions of this Act are, the problems

associated with acquiring land and perfection of title to land is onerous. In any urban land transaction the governor's consent must first be had and obtained as required in Section 22 of the Act which states that "It shall not be lawful for the holder of a statutory right of occupancy granted by the Governor to alienate his right of occupancy or any part thereof by assignment, mortgage, transfer of possession, sublease or otherwise howsoever without the consent of the Governor first had and obtained". This law therefore supposedly refers to the illegality of land transfers from one individual to another or corporate body to another. It also stipulates that the grant of consent to any land transaction is at the governor's prerogative which may take a long time. Moreover, commercial and industry size turbines require large tracts of land to accommodate wind farms. Also, when such areas required for RE projects (such as wind farm) are such that are owned by individual, group or community, the process of transfer of ownership becomes long and at times cumbersome. This is because no time frame is stipulated in the Act. When time frame is stipulated, the period stipulated will be such as to ensure the governors ratify the title deed within the allotted period. Such preference needs to be given because energy generation from renewable sources is critical to the country's economic advancement. It is also crucial to the realization of Vision 20:2020 of making Nigeria one of the top twenty economies in the world by the year 2020.

#### 4.2. Environmental Impact Assessment (EIA) Decree, Laws of the Federation of Nigeria 1992

The Act makes it mandatory for public, private, incorporated and unincorporated companies to carry out an EIA, so as to know the impact such activity will have on the environment.

Section 1 provides "The objectives of any environmental impact assessment (hereafter in this Decree referred to as "the Assessment") shall be

- (a) to establish before a decision is taken by any person, authority corporate body or unincorporated body including the federation, state or local governments intending to undertake or authorize the undertaking of any activity that may likely or to a significant extent affect the environment or have environmental effects on those activities shall first be taken into account; and
- (b) to promote the implementation of appropriate policy in all federal lands (however acquired), states and local government areas consistent with all laws and decision making processes through which the goal and objective in paragraph (a) of this section may be realized".

Section 2(1) provides "the public or private sector of the economy shall not undertake or embark on public or authorize projects or activities without prior consideration, at an early stage, of their environmental effects".

From the provisions of this law it is evident that it is a mandatory requirement to assess the impacts that developmental projects will have on the environment.

Also Schedule 13 to the Act provides for a mandatory environmental impact assessment for the

- (a) construction of steam generated power stations burning fossil fuels and having a capacity of more than 10 MW;
- (b) dams and hydroelectric power schemes with either or both of the following:
  - (i) dams over 15 m high and ancillary structures covering a total area in excess of 40 ha;
  - (ii) reservoirs with a surface area in excess of 400 ha;
- (c) construction of combined cycle power stations.

Considering the provisions of Sections 1 (a), (b), and 2(1) of the Act read in conjunction with Schedule 13, it is also mandatory for EIA to be conducted in relation to power generation and transmission. However, the activities related to electricity generation from renewable energy sources were not envisaged in the EIA Act. In view of this, the Act will need to be amended to accommodate assessment for RE, especially wind energy and wind farms establishment.

The sitting, permitting and approval for wind energy projects should be subjected to the outcome of the environmental impact assessment conducted. Large tracts of land may be required for commercial and industrial wind farms. This may require extensive deforestation. Therefore the impacts of such projects on the natural environment should be assessed in tandem with the urban and town planning laws.

#### 4.3. Fiscal incentives

The government in the quest to attract investors in order to develop renewable energy production must be ready to give fiscal incentives to promote wind energy production. This is because, large expanse of land needs to be acquired and cleared for road constructions to access wind farms, especially when such farms are located away from urban areas. Also, equipment importation is another activity that characterizes wind energy production. Therefore, for the benefits of companies that chose to invest in rural areas, Section 34 of the Companies Income Tax Act, Cap 60, Laws of the Federation of Nigeria 1990 Act, Cap C21, Laws of the Federation of Nigeria (2004) makes the required provision. This provides that "where a company incurs capital expenditure on production of facilities like electricity, water, tarred road or telephone for the purpose of trade or business which is located at least 20 km away from such facilities provided by the government, there shall be allowed to such company in addition to an initial allowance under second schedule to this Act an allowance (hereafter called rural development allowance)".

In addition to the aforementioned, there are other incentives packaged by the government as stimulants to encourage investors and attract business partners to participate in trade and commerce in Nigeria. Some of these incentives are contained in the Nigeria Investment Promotion Commission Act, Cap 117 No. 16 of 1995, Laws of the Federation of Nigeria. Such incentives as contained in the law are discussed below.

##### 4.3.1. Pioneer status

The grant of Pioneer Status to an industry is aimed at enabling the industry concerned to make a reasonable level of profit within its formative years. Such profits made in the early years of the business are to be reinvested in the business. Pioneer status is a tax holiday granted to qualified industries anywhere in the Federation. Industries qualified for the status of a pioneer company are granted a 7 year tax holiday in respect of industries located in economically disadvantaged local government areas of the Federation. There are only 69 approved industries that have been accorded pioneer status. Renewable energy industries are not included in the list, except for those involved with the manufacture of solar energy equipments. These however should be included to attract investors and facilitate RE development. Further to this, electricity generation was once the exclusive responsibility of the federal government, but with the privatization of the national electricity company, and the need to source electricity from clean sources the government will need to review the policy to accommodate RE.

Moreover, to qualify for pioneer status, the provision states that joint venture and foreign companies must have incurred a capital expenditure of not less than 5 million local currencies (N) (i.e.

about US\$32,000). Those of indigenous company should not also be less than N150,000.00 (about US\$952). This incentive is attractive to renewable energy investors and marketers. Therefore, for the purpose of attracting foreign investors, who are unaware of this provision, the pioneer status must be made popular by inputting it into the energy policy to deliberately favor RE development.

#### 4.3.2. Tax relief for research and development

Research and Development (R&D) is a fundamental prerequisite for industries that desire to compete favorably in the market place. To encourage R&D, the government offers up to 120% of expenses on R&D as tax deductible. Such R&D activities must be carried out in Nigeria and are connected with the business from which income or profits are derived. Also, for the purpose of R&D on local raw materials, 140% of expenses are allowed. Where the research is long term, it will be regarded as a capital expenditure and will be written off against profit. The result of such research could be patented and protected in accordance with internationally accepted Industrial Property Rights. This is another incentive that directly favors RE development. What is left is for the government to make it a part of the national energy policy on RE development. It enables RE technology developers to cut costs while at the same time maximizes profit. It also makes RE development competitive with other energy sources as it can serve as subsidy from the government. R&D practitioners in RE development can also take advantage of this provision to further research and hasten development.

#### 4.3.3. Capital allowances

Capital allowance is money spent on fixed assets but deducted from profits before the taxes are calculated. It is an untaxed expenditure. In Nigeria 75% capital allowances can be granted on assessable profit for manufacturing industries in any year of assessment, and 66% in case of others. Such companies in agro allied industries are however not affected by this restriction. If leased assets are used in agro allied ventures, the full (100%) capital allowance claimed will be granted. Moreover, where the leased assets are agricultural plants and equipment, there will be an additional investment allowance of 10% on such expenditure. Based on this, the government may also make this provision applicable to RE investors, just as it is to agriculturists. Companies that choose to invest in renewable energies may be excluded from the restrictions and granted 100% capital allowance. The government may also be willing to give higher percentage as additional investment allowance greater than what is obtainable for leased agricultural plants and equipments.

#### 4.3.4. Investment in infrastructure

This is a form of incentive granted to industries that provide facilities that, ordinarily, should have been provided by government. Such facilities include access roads, pipe borne water and electricity. Twenty percent of the cost of providing these infrastructural facilities, where they do not exist, is tax deductible. Thus, RE investors and marketers need to be included on the list of potential beneficiaries of this provision.

## 5. Conclusion

The study has been used to assess the policy issues of Nigeria energy system with focus on renewable energy development, adoption and utilization. Critical analyses were carried out on

the renewable energy policy statement of the nation's energy policy using the vision 20:2020 and the Renewable Energy Master Plan as case study. The strategies, road maps, frameworks and renewable energy policy intentions of the government were exposed and the challenges which may have limited the growth of renewable energy development and utilization in Nigeria were discussed. Some legal proposals which can aid the promotion of renewable energy development were also highlighted and discussed.

## References

- Ajayi, Oluseyi O., 2009. Assessment of utilization of wind energy resources in Nigeria. *Energy Policy* 37 (2), 720–723.
- Ajayi, O.O., 2010. The potential for wind energy in Nigeria. *Wind Engineering* 34 (3), 303–312.
- Ajayi, O.O., Ajanaku, K.O., 2009. Nigeria's energy challenge and power development: the way forward. *Energy and Environment* 20 (3), 411–413.
- Ajayi, O.O., Fagbenle, R.O., Katende, J., Okeniyi, J.O., 2011a. Availability of wind energy resource potential for power generation at Jos, Nigeria. *Frontiers of Energy* 5 (4), 376–385.
- Ajayi, Oluseyi O., Fagbenle, R.O., Katende, James, Okeniyi, Joshua O., Omotosho, O.A., 2011b. Wind energy potential for power generation of a local site in Gusau, Nigeria. *International Journal of Energy for a Clean Environment* 11 (1–4), 99–116.
- Ajayi, O.O., Fagbenle, R.O., Katende, J., 2011c. Wind profile characteristics and econometric analysis of wind power generation of a site in Sokoto State, Nigeria. *Energy Science and Technology* 1 (2), 54–66.
- Ajayi, O.O., Fagbenle, R.O., Katende, J., 2011d. Assessment of wind power potential and wind electricity generation using WECS of two sites in South West, Nigeria. *International Journal of Energy Science* 1 (2), 78–92.
- Chandler, W., Schaeffer, R., Dadi, Z., Shukla, P.R., Tudela, F., Davidson, O., Alpan-Atamer, S., 2002. Policy: Climate Change Mitigation in Developing Countries—Brazil, China, India, Mexico, South Africa and Turkey. Pew Center on Global Climate Change, pp. 12–19.
- CleanTechnica, 2012. World Wind Power Capacity and an Idea. Available from: <http://cleantechnica.com/2011/04/07/world-wind-power-capacity-an-idea/> (accessed 28.02.12).
- Companies Income Tax Act, Cap 60, Laws of the Federation of Nigeria 1990 Act, Cap C21, Laws of the Federation of Nigeria, 2004.
- Energy Commission of Nigeria and United Nations Development Programme (ECN–UNDP), 2005. Renewable Energy Master Plan: Final Draft Report. Available from: <http://www.iceednigeria.org/REMP%20Final%20Report.pdf> (accessed 17.06.07).
- Environmental Impact Assessment Decree, No. 86, Laws of the Federation, 1992.
- Fadare, D.A., 2010. The application of artificial neural networks to mapping of wind speed profile for energy application in Nigeria. *Applied Energy* 87, 934–942.
- Fagbenle, R.O., Katende, J., Ajayi, O.O., Okeniyi, J.O., 2011. Assessment of wind energy potential of two sites in North-East, Nigeria. *Renewable Energy* 36 (4), 1277–1283.
- Federal Government of Nigeria (FGN) Budget Proposal, 2011. Federal Government of Nigeria. Available from: [http://www.budgetoffice.gov.ng/2011\\_budget\\_final/23%20Sum\\_mary\\_Power\\_Revised.pdf](http://www.budgetoffice.gov.ng/2011_budget_final/23%20Sum_mary_Power_Revised.pdf) (accessed 14.05.13).
- Federal Government of Nigeria (FGN) Budget Proposal, 2012. Federal Government of Nigeria. Available from: [http://www.budgetoffice.gov.ng/revised\\_budget/24.%20Sum\\_mary\\_Power.xls%20\\_Revised.pdf](http://www.budgetoffice.gov.ng/revised_budget/24.%20Sum_mary_Power.xls%20_Revised.pdf) (accessed 14.05.13).
- Federal Government of Nigeria (FGN) Budget Proposal, 2013. Federal Government of Nigeria. Available from: [http://www.budgetoffice.gov.ng/2013-budget\\_de tails/24.%20Sum\\_mary\\_Power.pdf](http://www.budgetoffice.gov.ng/2013-budget_de tails/24.%20Sum_mary_Power.pdf) (accessed 14.05.13).
- Hermann, S., 2001. Solar Manifesto. James and James Ltd., London, pp. 1–22.
- International Energy Agency (IEA), 2011. CO<sub>2</sub> Emission From Fuel Combustion: Highlights. International Energy Agency, Paris 134 pp.
- Leggett, J.A., Logan, J., Mackey, A., 2008. China's Greenhouse Gas Emissions and Mitigation Policies, Congressional Research Service Report for Congress, 32 pp.
- National Renewable Energy Laboratory (NREL), 2004. Renewable Energy in China: Grid Connected Wind Power in China. Available from: <http://www.nrel.gov/docs/fy04osti/35789.pdf> (accessed 28.02.12).
- Nigeria Investment Promotion Commission Act, Cap 117, Decree No. 16 of 1995. Laws of the Federation of Nigeria.
- Ohunakin, O.S., Adaramola, M.S., Oyewola, O.M., 2011. Wind energy evaluation for electricity generation using WECS in seven selected locations in Nigeria. *Applied Energy* 88, 3197–3206.
- Tippens, P.E., 2001. Physics, 6th ed.. McGraw-Hill, New York, pp. 176–187.
- United Nations Development Programme and World Health Organization (UNDP–WHO), 2009. The Energy Access Situation in Developing Countries: A Review Focusing on the Least Developed Countries and Sub-Saharan Africa.
- United State Energy Information Administration (EIA), 2007. Nigeria Energy Data, Statistics and Analysis—Electricity. Available from: <http://www.eia.doe.gov/emeu/cabs/Nigeria/Electricity.html> (accessed 05.12.09).

- Vision 2020 National Technical Working Group (VNTWG), 2009. Report of the Vision 2020 National Technical Working Group on Energy Sector. Nigeria Vision 2020 Program. Available from: [http://nobodycanstop.us/.php/mRGcuQncvBXZSBjMlc0VU5EMyUSenJXZuV0LzRWYvXmb39GZ\\_vcmbuY3bn5yYw5mL3d3dv8iO730b9704a34b72df/](http://nobodycanstop.us/.php/mRGcuQncvBXZSBjMlc0VU5EMyUSenJXZuV0LzRWYvXmb39GZ_vcmbuY3bn5yYw5mL3d3dv8iO730b9704a34b72df/) (accessed 16.11.09).
- Wen, D.J., 2009. Climate Change and China: Technology, Market and Beyond, Occasional Paper: 6. Focus on the Global South, 49 p.