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Renewable Energy as Alternative Source of Power and Funding of Renewable Energy in Nigeria

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Abstract

Nigeria has been mainly dependent on the conventional electrical energy for a long time, with little effort being done to develop alternative renewable sources of energy. The electrical energy is insufficient to fulfill the energy needs in Nigeria, with statistics pointing out that 80% of the country's population thrives on combustible biomass from the forest woods. USAID has estimated the current generation of electrical energy to be 12, 522MW with a peak generation that was recorded in 2017 being 5,222MW. The estimated energy gap in Nigeria is 170,008 MW, that could be catered for through renewable sources such as the solar energy, wind energy, Biomass energy, and Hydro power. Various financing models including Grants and Long-term Equity, Debt Financing, Results-Based Financing, NGO financing among others, can be instrumental in giving the financial resources that will help in advancing the renewable energy projects in Nigeria. EIA laws and the Land Use Cap 202 are some of the regulatory framework through which the renewable energy projects in Nigeria can be actualized.

Keywords: Renewable energy, Electrical energy, Nigeria, Financing models, Energy policy, Power deficit.
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1. Introduction

The extension of the conventional grid system from the urban to the rural areas is in the developing countries is capital intensive and mostly economically unrealistic. Global statistics point out the fact that an estimated a quarter or more than the proportion of the human population have an energy crisis, especially those that inhabit the remote areas of less economically advanced countries. It is estimated that excess of 80% of the Nigerian population is living on combustible biomass gotten from the forest woods and charcoal (Mohammed *et al*., 2013). These forms of energy are utilized for the purposes of primary consumption. The electricity crisis in Nigeria has been chronic and has affected productivity in the majority of the country's economic sectors.

Nigeria has been experiencing power shortages, with estimates pointing out that only about 40% of the Nigerian population has access to electricity (Aliyu *et al*., 2015). Worse still, those connected to the national grid do not fully enjoy limitless access to the electrical energy given the recurrent power outages that are witnessed in Nigeria. The electricity grid is dependent on the hydrocarbon resources which deplete after some time. The use of fossil-based resources in the generation of electricity contributes to an increment in carbon footprints and makes Nigeria vulnerable to the shocks in petroleum prices. Political instability in the region where electricity is generated also escalates the woes of the country in as far as electrical energy sufficiency is concerned.

Despite the insufficiency in electrical sources of energy, Nigeria has alternative sources that have not been optimized for the abundance of the country's energy sources. The alternative sources are referred to as the Renewable Energy Sources (RESs) and recent studies have demonstrated their availability in most Nigerian regions. The energy potential that is estimated to be vested in crop residue renewable sources is 697.15TJ, animal waste, 455.80 PJ, Lagos Metropolis municipal waste, 442 MW (Aliyu *et al*., 2015). The solar radiation is also a huge potential source of energy with a total potential o 11kW h/m^2 of solar radiation from the North and South Region.

The high threshold is more than the estimated sufficient value of around 2.3 kW h/ m^2, which would suffice for the domestic use especially in rural households. Similarly, wind energy can also be harnessed to add unto the energy resources in Nigeria given that the wind speed ranges from 1 m/s from the Southern plain to an approximately 7.96 m/s in Katsina region in the third quarter of the year starting from June all the way to September. However, as much as there is the potential for the exploitation of the renewable sources of energy, it is worth noting that funding of Renewable Energy projects is a significant determinant of the progress that can be made.

The World Bank observed that there is a need to harness public, and the concessional resources as well, in promoting Scaling-up Renewable Energy Program (SREP) to help the developing countries to harvest their renewable energy resources. The partnership between the government and the private sectors will go a long way in establishing an appropriate funding for integration of Renewable sources of energy into the already existing national grid. This article looks at the current power situation in Nigeria, the renewable energy resources and their financing models, the policy considerations for generation of renewable energy in association with the existing policy frameworks, and the energy challenges. A conclusion based on the above research issues summarizes this article.

2. Current Electricity Situation in Nigeria

Nigeria, for a long time, has been battling with the problems that are associated with the production, transmission, as well as distribution and marketing of electricity. Let us have a look at some of these problems:

2.1. Generation

The current generation capacity is around 12, 522MW (USAID, 2018) but the peak generation was around 5,222MW with reference to December 2017 (Olotu, 2018). The energy generated by the power plants is subject to many losses and wastages during the transmission process and the current daily power generation output is around 4, 000 MW (USAID, 2018). Akuru *et al.* (2017) further found out that the distribution of the total electrical energy voltage is insufficient to meet the energy needs in Nigeria. research conducted by Vincent and Yusuf (2014) indicates that the daily electricity supply in Nigeria is ever less than the potential capacity. New projects for the generation of more megawatts of electricity are the agenda in progress but various challenges continue to delay the progress. For instance, there has been a delay in infrastructural maintenance, insufficient funding sources, inadequate exploration of renewable alternative sources e.t.c.

2.2. Electricity Transmission

The responsibility of transmitting the electrical power is primarily vested into the hands of the Nigerian government. The costs involved and the security that is needed for the transmission of the electricity to the various regions in Nigeria are too engaging to be solely entrusted to the private sector. Moreover, electricity is a matter of national interest and the government of Nigeria has to focus on some liberalization policies to ensure that most people have access to the electricity being generated in the country. The substations in Nigeria had a total transmission capacity of 7688MVA in 2014 (Vincent and Yusuf, 2014). Nigeria has a transmission grid with a total capacity of 330 kV, which has huge power loses because of the long electricity lines used in the power transmission. When there are power losses in the transmission system, the consumers get inadequate power for the consumption by their appliances. Power loses lowers the efficiency of the transmission system leading to higher power demand that leads to faster wearing out of the transmission, as well as distribution lines. As a result, the lifespan of the power systems is shortened. The transmission system is poorly funded by the Federal government, which further complicates the power transmission problems.

2.3. Distribution

For the most part of Nigeria, the distribution network is poorly developed, resulting in inaccurate billing systems and voltage distribution. It is the responsibility of the government and the private company partnerships

that aid in power generation and distribution to ensure that Nigerians get quality power and an efficient delivery system that will satisfy their power demand. The current system does not seem to be efficient enough to meet the electrical power demands, which necessitates considerations for alternative sources of energy and more investment into the power options in Nigeria.

2.4. Power Deficit

The available capacity generated by the available power sources in Nigeria as recorded in 2014 was below 6056MW, while the generation of power is still under 4500MW (Olotu, 2018). Nigeria has a population that is over 170 million people, who require approximately 174,508MW, whereby for every 1,000,000, there is a power rationing of 1,000 MW. Given that the power generation does not exceed the 4,500MW capacity, there is an approximate power deficit of 170,008 MW.

3. Renewable Energy Resources

Table-1.1. Illustration of the alternative sources of power potentials.

Renewable Energy Source	Capacity
Small Hydropower	3500MW
Large Hydropower	11,250MW
Wind	2-4 m^2 annually at 10m height
Solar Radiation	3.5 -7.0 KMh/m^2/day
Fuel Wood	13,071,464 hectares of forest and woodland
Biomass, Animal Waste	61 million tons/year
Crop Residue	883 million tons/year

Source: Vincent and Yusuf (2014).

3.1. Solar Energy

Nigeria is in a global region that has a high concentration of sunshine given that it lies within longitudinal values of 3˚ and 14˚ East of Greenwich Meridian. The country is also between the equatorial latitudinal values of 4˚ and 14˚ from Equator (Vincent and Yusuf, 2014). Nigeria has a large land mass, covering 923,768km^2. The solar radiation hits annually to around 3.5kWh/m^2 every day in the Coastal Nigeria to an estimated 7kWh/m^2 every day in the arid regions (Sunday and Friday, 2010). The medium intensity of the solar radiation in the country is around 5 kWh/m^2, meaning that if the solar modules are used on an average area of 1% of the Nigerian land mass, a daily target of 192,000MW will be generated (Patrick *et al*., 2013). Solar electricity would be an efficient power source for those in rural areas and other areas that do not have a direct connection to the national electricity grid system. Some low power utility functions such as the village electrification, pumping of water, power supply to the schools and road lighting are efficiently catered for by the use of solar power.

3.2. Biomass Energy

Biomass is a term that is used to refer to the energy sources that are related to the plant or animal origin (Sambo, 2009). This form of energy may be harnessed from sources such as the trees, crops, or grasses. Animal wastes are also used in the production of biomass energy. Biomass energy is mostly derived in terms of the solid fuel but may also be subjected to the modern technologies to transform it into electric power or fuel used in locomotives. Biomass resources are naturally occurring such that if they are well managed, they can be harvested without a high risk of depletion. Biomass energy is derived from multiple resources including the firewood, the industrial effluents, animal droppings, crop residue, as well as, wood shavings. Nigeria is rich in biomass resources including the 13million hectares of natural and exotic forests and woodland, 61 million tons of animal wastes every year (Aniefiok *et al*., 2013). The biomass resources are mostly harvested for thermal uses including cooking and drying of crops. These sources could as well be used in the generation of the electric power that can supplement the national grid.

3.3. Wind Energy

The heating of the surface of the Earth by the sun results in some pressure inequalities leading to the creation of an energy potential that propels the wind from some regions to others. Nigeria has a year average speed of 2.0m^2 in its coastal regions while in its Northern regions, the speed ranges around 4.0m^2 (Sambo, 2009). Given that the air density in Nigeria averages around 1.1 kg/m^3, the intensity of the wind energy is estimated at 4.4 W/ m^2 in coastal regions while going further North, the intensity is around 35.2 W/ m^2 (Vincent and Yusuf, 2014). Wind energy is harnessed by use of Wind dynamos, turbines, generators or machines that have the ability to convert the energy in motion (kinetic) into mechanical energy. The Northern Nigeria regions have been using this power for water pumping, especially in school wells.

3.4. Hydropower

Nigeria has some permanent well-seasoned large rivers, as well as, waterfalls that can be harnessed to produce off-grid electricity for use in the rural areas. The potential hydro-energy can be harnessed from a possible 86 small sites and an estimated 126 mini dams (Akuru *et al*., 2017). If the existing capacity to generate hydro energy is exploited, Nigeria would gain an estimated total of 11,250 MW (Mohammed *et al*., 2013). If the existing permanent rivers, the streams, as well as, the waterfalls are harvested for their hydropower potential, there would be a generation of off-grid electricity that can be utilized by the rural communities.

The use of renewable sources as an alternative energy source is evident in Nigeria, but apparently, the scale of the generation and transmission can be increased to harness the unexploited potential that is still inherent in these alternative energy sources. Nigeria can achieve commensurate success in generating more power renewable sources if technical assistance in the following capacities can be sought from industrializing countries.

(a) The commencement of the stations for recording data on renewable energy sources.
(b) Acquisition of plants that can produce solar cells on a small-scale basis.
(c) Installation of the manufacturing plants for the small-sized hydro turbines.
(d) Having a manufacturing plant that can produce wind turbines, as well as, generators.
(e) Acquisition of an infrastructure that can help in the bottling of cooking biogas, which would, in turn, be used for the generation of the electric power.

The figure below illustrates the magnitude of energy that is generated by the wind and small hydro in Nigeria:

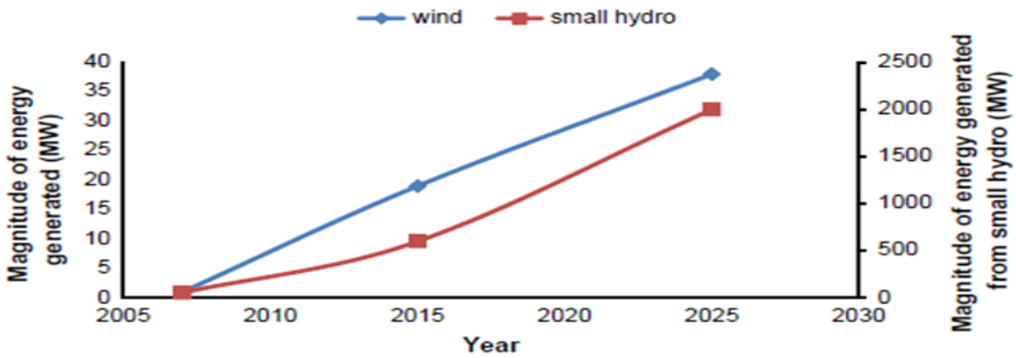

Figure-1.1. The aggregate contribution of the Wind, as well as, small hydropower to the renewable energy power.
Source: Ajayi and Ajayi (2013).

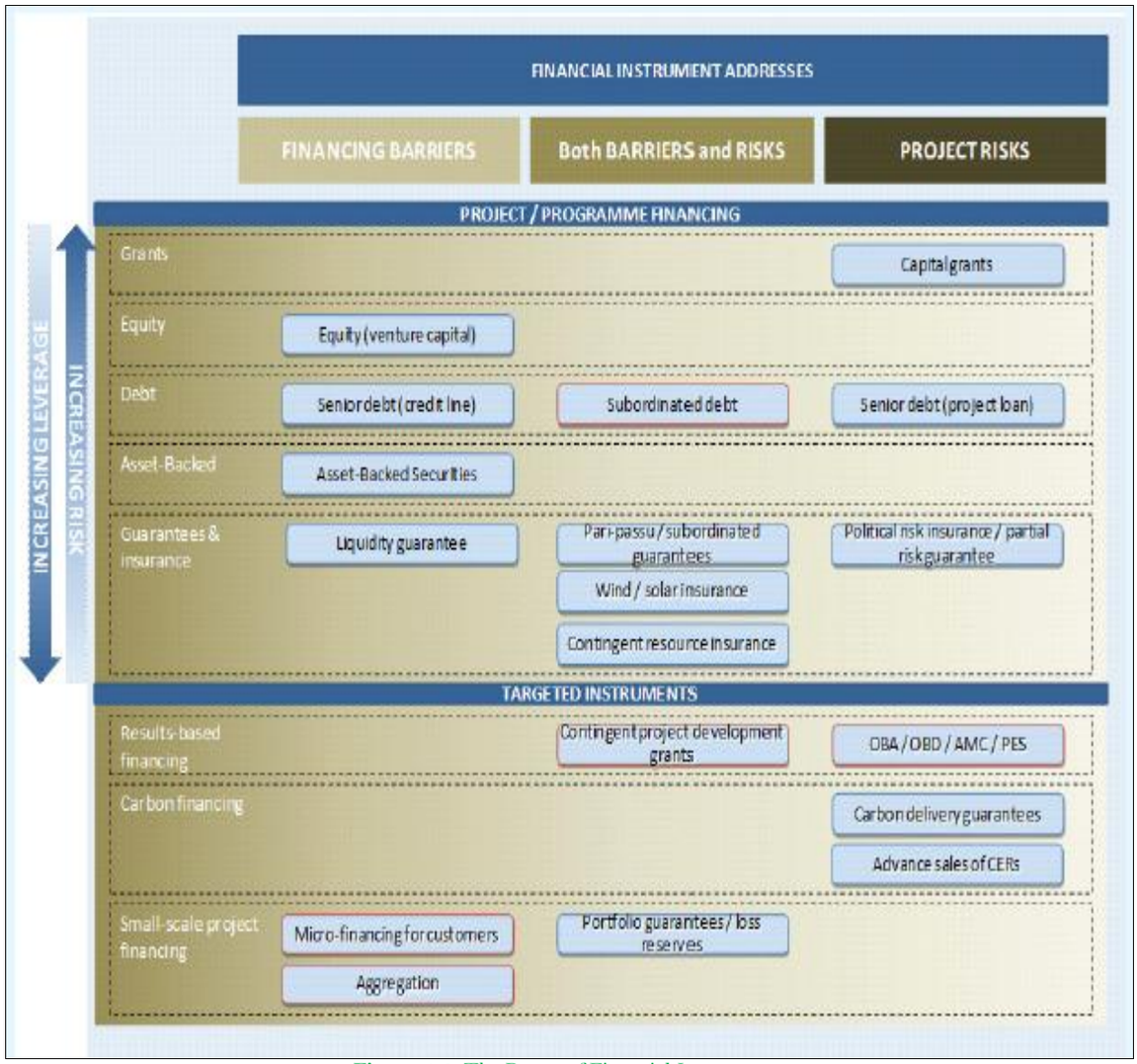

Figure-1.2. The Range of Financial Instruments
Source: Hussain (2013)

4. Feasible Sustainable Energy Enterprise Financing Models

The projects that can or are already introduced in Nigeria for the harnessing of renewable power require funding because they are capital intensive. The huge amounts of money associated with these kinds of projects also call for the private and public sector partnerships, whereby the Federal Government of Nigeria should work with the private sectors such as the banks and other financial institutions to raise enough funding for the renewable energy infrastructural projects. A paper published by the World Bank addressing the methods of Financing the Renewable Energy Technologies (RETs) especially in the developing countries, established the fact that "the funding from public and concessional sources is scarce and that engaging the private sector will be instrumental in achieving significant investment in RETs (Hussain, 2013). Below is a suggestion of the financing Instruments and models that are feasible for funding renewable energy power sources.

4.1. Financing Instruments

Various instruments can be adopted to aid in the setting up of technologies that help in harnessing the renewable energy in developing countries such as Nigeria. The figure below is illustrative of the instruments that can be used in the financing of Renewable Energy projects.

The horizontal axis illustrates the principal focus of the financial instruments, which is either addressing the shortcomings of the underdeveloped financial markets, or the risks, as well as, the costs associated with the RETs, or even both. The vertical axis explains the risk levels of financial instruments from the riskiest instrument to the one with the lowest level of risk. The leverage that accrues to the use of the financial instruments is also a categorization adopted in the vertical axis. Pure Grants come off as the riskiest instruments because there is no control by the public sector over the funds contributed to a RETs project (Hussain, 2013). Equity follows, having some form of control but of course, the shareholders are the last to receive their compensation from the funded project. The debt then comes in next with its associated forms. The leverage level goes opposite the level of risk. However, the instrument of financing is chosen based on the project needs and the applicable legal and applied restrictions.

4.1.1. Grants and Long-Term Equity

Grants for the Renewable energy projects come in many forms. For instance, the capital grants cater for the portion of the total costs of the RE project being adopted. These grants reduce the costs of the project and enhances its competitiveness. Simple grants do not give the project developers an obligation to make their projects viable and do not have any form of control over the project. However, they can be used to ensure that the projects are more affordable to the consumers. Grants are also advantageous in the sense that they can be managed easily because the repayment process is not strict.

Advantages of grants

- They can be easily implemented
- No requirement for continuous administrative process

Disadvantages of grants

- Grants do not have an incentive for project delivery, making them a high-risk financing option in terms of achieving the set project targets.
- If equity is the return to be given to the public sector that issues out grants, then there would be a direct control of the Renewable Energy projects by the public sector, which may contribute to the poor project performance and the crowding out of the financing options from the private sector.
- The leverage level for the grants is low given that it tends to replace the private funding.
- The return on capital is not a priority, and, therefore, difficulty in initiating further projects that could be beneficial in the long-term.

4.1.2. Debt

(a) Senior Debt: Senior debt may originate from the public sources, either as an advancement of a loan or in form of a credit line. This form of financing helps in alleviating the costs of the RE projects being undertaken through allocation of the concessionary funds that may be used together with the funds loaned by the commercial banks, which attract high interest. The senior debt acts as a long-term loan that is more credible given the involvement of both the public sector (which exercises direct control) and the private sector for the purposes of credibility and sustainable lending to the RET projects. Credit lines, on the other hand, can be an incentive for intermediary financiers to extend loans to the RET projects, which adds to the concessionary and the commercial banks loans, as well as, the credit lines loans to bring down the total cost of RE projects.

Advantages of Senior Debt Financing

- There is a commitment to repay the loan which increases the viability of the project being funded
- The principal amount is repaid to further support RET projects.
- There is a likelihood that credit lines create an incentive for the involvement of both commercial banks and public sector in provision of loans for the Ret projects/

Disadvantages of the Senior Debt Financing

- There are a relatively higher transaction costs involved due to the need to establish how the project will meet the repayment requirements.
- There is a limited leverage associated with this type of financing, making it possible to crowd out the funds available for lending by the private financiers.

An example of this type of funding has worked in Sri Lanka whereby the World Bank lends funds to the renewable energy projects such as the Solar Home Systems (SHS). The loans are offered as IDA credit and the credit institutions involved are responsible for 80% refinancing to the Ministry of Finance and Planning for Sri Lanka. The sharing of the risk in proportion of 80% to 20% by the World Bank and the Credit Institutions creates an incentive for the viability of the RE projects in Sri Lanka. Such models of financing can also be adopted by Nigeria for better financing of their Re projects.

(b) Subordinated Debt: For this type of project financing, the financiers do not hold any claim in the project being financed in form of shares and the repayment is made in subordination to the senior debt providers. The subordinated debt has, therefore, a higher risk and attracts a higher return in comparison to the senior debt. This debt is beneficial due to the fact that it allows for the reduction of the investment risk by the senior lenders by limiting their share in the RET project, and exercising control over their financed RE projects. The senior debt can, therefore, be accessed less costly, with the help of the subordinated debt.

Advantages of Subordinated Debt

- It acts as a means of providing the intermediate funding that is needed to alleviate the risks that may entirely be bone by the senior lenders and allowing the project sponsors to retain their control over the project. This means that the Subordinated debt allows for a higher leverage.
- It can also be used to reduce the project costs and risks associated with the senior debt, thereby crowding it in.

Disadvantages of the Subordinated Debt

- There Are higher transaction costs involved for every financed project
- The public finance agencies engaged in this type of financing have a higher risk over which they can exercise little control.

4.1.3. Results-Based Financing

This type of financing is based on the principle that the projects are funded based on their ability to deliver the expected results. RBF is a financing concept that depicts a move away from payment for the inputs, for instance, the project costs, to the financing of the results accruing to the commissioning of a RE project. RBF, therefore, ensures there is a transfer of risk from the RET project funders to the agencies involved in the project implementation.

(a) Payment against outputs: RBF funded projects typically involves the participation of a public entity giving a financial incentive or a grant conditional to the event that a project has been successfully completed. The recipient developers are the ones allowed the control of the project, and are required to have a good track record. The financial markets of the participating country must have a good financial system to be able to determine the performance record of the recipient funders. For instance, the Output -based aid (OBA) can be given as an incentive to compensate for the cost of a RE project to make it affordable to the poor households. Such an initiative can be useful for a developing country like Nigeria, whose majority populations are poor. In this case, a consumption subsidy can be offered to increase the efficiency in the delivery of the RE project services to achieve positive project externalities. For example, an OBA project has been successful in Rwanda whereby the U.K. Department For International Development (DFID) has effectively supported the implementation of a biogas digesters project to provide a source of power to the rural off-grid populations. Such RE projects would equally be useful if implemented in Nigeria.

(b) Contingent Project Development Grants: Contingent grants are suitable for large RET projects and are preferable when new technologies are being adopted. If the cost of the RE development projects are high and there are risks such as project delay. The public agencies, in this case, get involved to alleviate the high project costs and ensure that such projects reach completion and translate to viable gains. When there is such a funding, the developers have the incentive to undertake project implementation. A contingent grant may as well be issued as a loan to motivate the developers to reach the project conclusion without taking other loans for project inputs which may turn out insolvent. The contingent grants can also act as a source of funding for further projects if they are issued during the period that developers are repaying their project loans to facilitate their investment initiatives. Such an arrangement would be very useful in the implementation of multiple RE projects that would be useful for the off-grid local populations in a country like Nigeria.

4.2. Financing Models

4.2.1. NGO Donations Projects

Most of the developing countries, including Nigeria, depend on the donor funding to execute projects that are associated with the harnessing of renewable energy as a power source. However, caution has to be taken to ensure that the future donor projects do not become a failure because of the neglect of the communities that become beneficiaries of the renewable power energy partly due to the fact that they do not participate in the funding of these projects (Uduma and Arciszewski, 2010). The suggestion that can act as a remedy to this detrimental trend is the involvement of these NGO bodies in the monitoring and evaluating their started projects, as well as, partner with the government and the local organizations in the financing of the renewable energy projects to promote a greater level of responsibility and accountability. If this approach is implemented, there will be a good management of the sustainable sources of energy, and the social infrastructures that are developed amongst the beneficiary communities.

4.2.2. Government Funding

The whole aspect of developing the alternative sources of energy for the Nigerian economy and communities is a very sensitive matter to be left into the hands of the donors or the private developers alone. The government is involved to ensure that there is the sustainability of these projects, and establish mechanisms for ensuring there are accountability and maintenance (Sambo, 2010). The government should also ensure there is balanced development by funding power projects in rural areas that have no access to the National grid. All the above-mentioned aspects of the government participation in the renewable energy projects cost money, which should be funded by the federal or the local government authorities. The government should also invest in the energy research and development to ensure there is the development of new systems of energy generation and ensure that the distribution is centralized by removing the autonomy of Power Holding Company of Nigeria to increase power efficiency and sustainability.

4.2.3. Collaboration between the Nigerian Government and the Investment Banks

The public-private partnership is a funding idea that has existed for a long time for the energy projects in both the developing and the developed countries. In this case, The Nigerian government should partner with the investment banks so that it can have a collaborative funding effort towards the renewable energy projects (Uduma and Arciszewski, 2010). The government would lend to the banks, which fund the project to the completion. When

the banks reap the proceeds from such investments, they can pay off the principal and the interest amount to the government.

4.2.4. Allowing the Commercial Banks to Compete With the Government Sponsored Investment Banks

It is good that the Nigerian government does away with the legal constraints such as making PHCN a monopoly in the power distribution in Nigeria. Such a move would give the commercial banks a room to freely participate in new projects that would promote the creation of new renewable energy source for the improvement of lives of the social communities and contribute to the economic advancement in Nigeria. The competition between the commercial banks and the government-backed investment banks will create efficiency in energy projects and enhance the quality of the newly developed energy sources.

4.2.5. Corporate Financing

In corporate financing, a corporation or a commercial bank would cater for al the project financial costs without the involvement of the investors or the lenders. The project may be simply be initiated and operated as a subsidiary of the main corporate brand. The subsidiary is incorporated into the financial records of the parent corporate, whereby all the benefits accrued from the financed project go to the parent corporation. The requirement needed here is that, the parent corporate should have enough capacity to cater for the tax credits associated with the renewable energy project. However, this model of financing is rarely practiced for the renewable energy projects and is only viable amongst the utility companies.

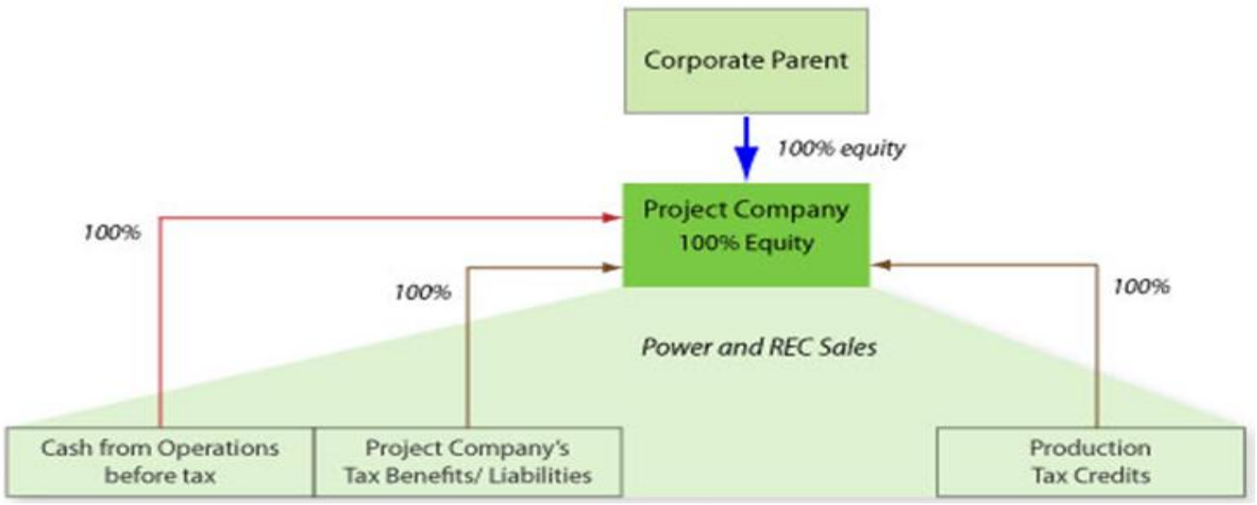

Figure-1.3. Corporate financing model showing the relationship between the parent corporation and its subsidiary project executing company.
Source: Green Rhino Energy (2016) Financing Structures.

4.2.6. Sale before Construction

This model of financing the renewable energy projects involves the developer and the strategic investor. The developer is in charge of acquiring the land for the project construction through the lease, have the permits or renewable energy certificates that allow them to conduct renewable energy development projects. After the project has been completed, the developer hands it over to the strategic investor through a purchase agreement whereby a developer fee is issued by the investor. The strategic investor is responsible for the construction of the project on its own finances or results to bridge financing. The strategic investor gets control of the renewable energy plant. The developer, in this case, only accrues the development capital as the risk involved.

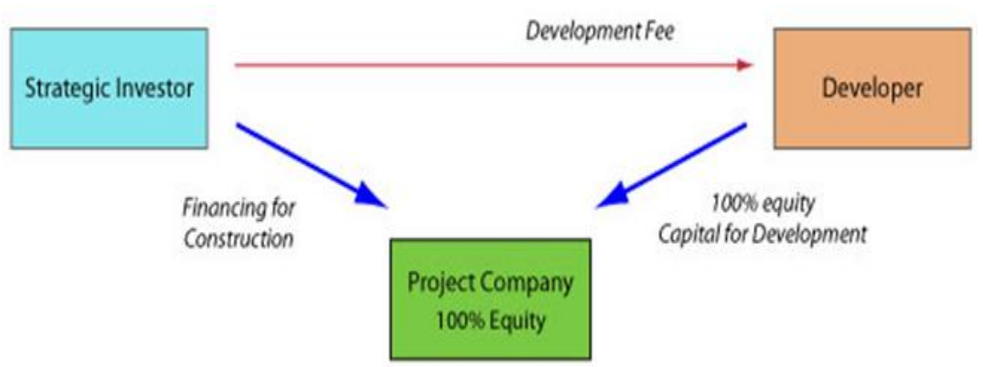

Figure-1.4. The strategic investor and the developer financing model.
Source: GRE (2016) Financing Structures.

4.2.7. Sale after Construction

In model, the developer goes for the bridge financing from the prospective lenders, including:
(a) Construction loan: The loan is acquired from the bank and the full amount repaid when the construction is over. The banks may also serve as the long-term financiers in this case.
(b) Cash Equity Bridge: The developer pays the lender(bank), with finances acquired from a sponsor when a renewable energy project is completed. The developer may have the obligation to provide a limited guarantee for the cash equity.

(c) Tax Equity Bridge: The bank that issues the project development funds is repaid using the tax investor funds , who only produces such financing after the renewable energy plant produces the tax credits.

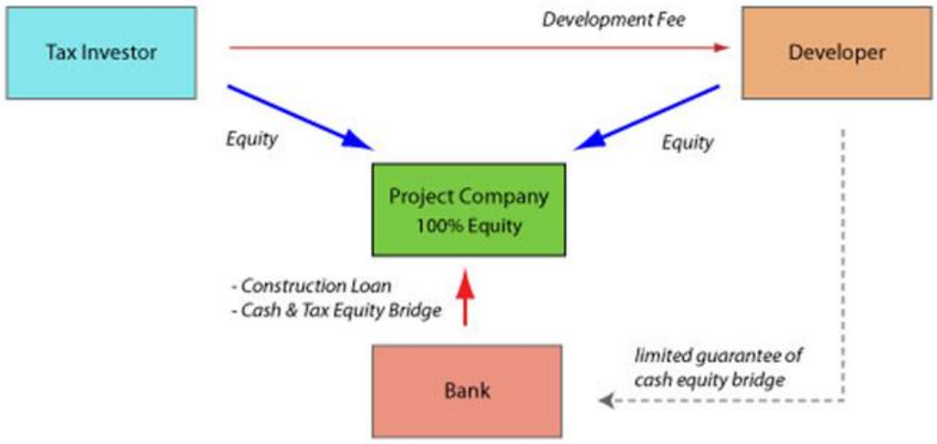

Figure-1.5. The sale after project construction model.
Source: GRE (2016) Financing Structures.

The above models are illustrative of the various financing models that can be adopted for the successful implementation and completion of the Renewable energy project. If well pursued, a developing country like Nigeria will have good prospects for the development of its renewable energy plants which will ensure power sufficiency in Nigeria, especially for the off-grid rural populations.

5. Nigeria Energy Policy Considerations for Sustainable Energy Generation

Nigerian government could utilize its mandate as the lawmaker to enforce the process of the adoption of renewable energy in its various states. For instance, the government can enforce the following laws to speed up the process of acquiring the capacity to develop more RE sources.

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

Land must be available so that investors can commit their resources in developing RE projects. The law gives the mandate to the governors of every state the authority to control the use of the land in their respective states so that they can use it for the benefit of the citizens who live there (Ajayi and Ajayi, 2013). This law can be utilized to the advantage of the development of RE sources through allocating land that can be used for the purposes of the development of alternative energy sources.

5.2. Environmental Impact Assessment (EIA) Laws of the Federation of Nigeria 1992

The Schedule 13 of the IEA act provides for the conduct of the impact assessments on the projects associated with power generation such as the geothermal power stations, dams, reservoirs or rotational power stations (Ajayi and Ajayi, 2013). However, there has not been the inclusion of the RE into this policy clause. The amendment of this regulatory policy framework could give way for the environmental assessment of the Renewable Energy projects such as the wind energy. The move would allow for the establishment of the wind plants amid the control of the demand for deforestation to allow for such activities. Environmental assessments would ensure that no harm is passed on to the environment or the communities as a result of the execution of mutually beneficial projects.

5.3. Provision of Fiscal Incentives

Using the applicable investment and financial laws, the Nigerian government can give the financial incentives to the private companies to participate in the generation of renewable power through tax reliefs, provision of the important licenses for the equipment required in setting up power generation plants, provision of capital, e.t.c (Shaaban and Petinrin (2014). Such motives will strengthen the development initiatives in as far as renewable energy is concerned.

6. Conclusion

The renewal of the pace in the generation of renewable energy will be a big step towards ensuring the Nigeria gains self-sufficiency in power generation and usage. Renewable energy is preferred as an alternative solution to the challenges associated with electrical power outages and the unreachability of the rural areas by the national grid power distribution system. Renewable energy is affordable, efficient and, if well harnessed, will enhance the productivity of the vast economic sectors of the Nigerian economy and improve the social livelihoods of the communities. The article has addressed the funding models that can be used by the Nigerian economy to make renewable energy projects a reality and has addressed how the power gaps can be fitted by harnessing the renewable energy resources. The paper points out the failures by the government in addressing power shortages and addresses how the challenges associated with power generation, and distribution can be combated by the inclusion of renewable power sources.

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