ACADEMIA | Letters

Nigerian Energy Crisis: Exploring Renewable Energy Solutions in the New Decade

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Nigeria is Africa's largest economy with a population of over 200 million people, over 300 indigenous languages, but of prime economic significance, is Africa's largest exporter of crude oil, and has since its independence been reputed to be the "Giant of Africa"; Africa's greatest prospect for growth and development (Nordea Trade, 2020). However, this general sentiment has since been watered down by its seasonal corruption, gross structural under-development, and an expanding poverty bracket despite its rather buoyant economy. Arguably, no fact disputes Nigeria's giant hood more than the anemic failure to attain nationwide constant power supply. Blessed with an abundance of energy resources - renewable and non-renewable - which can potentially meet the energy demands of its growing economy, and realize its ambitions of a full, national scale electrification grid, Nigeria currently sits among the lowest electricity consumers per capita in Africa which is quite contrasting considering it's over 200 million-man population. With demand grossly exceeding supply, erratic power supply which sees some regions of the country experience a maximum of 4 hours of supply daily with interruption periods in between spanning days and even weeks without prior notice (Aliyu et. al, 2013).

A lot of effort has been made though. Since electricity was first generated in Lagos in 1886 starting at a low of about 60 kWh (The Nigerian Economist, 1987), power generation capacity now sits at about 4, 000MW with the potential to generate up to 12, 500MW (USAID, 2020). This is grossly insignificant in comparison with other nations even amongst its African neighbors, however, the bulk of the responsibility of power failure lays at the point of transmission. Current transmission capacities sit at about 7, 500MW but fall short to about 4, 000MW due to inefficiencies, thus even current generation capacities are far from being maximized in transmission across the grid (NERC, 2021). Starting as a government-managed

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organization, the National Electrical Power Authority (NEPA), fund misappropriations, poor project management, and the generally epileptic power supply affected the state of stagnancy that inspired the privatization to be called Power Holding Company of Nigeria (PHCN) in 1999 (Ujah, 2006). After over 16 billion USD of investment between 1999 and 2007 under the Olusegun Obasanjo administration, little or no progress was made (Voice of America, 2009). Whatever progress was witnessed however then inspired the entire privatization of the distribution segment of the industry into eleven "private" distribution companies (DISCOs) (Aminu and Zainab, 2014). The privatization model for this engagement was flawed, however, as it was overly optimistic, relying on the benevolence of the private distribution corporations to maintain fairness with wage structures and cost of energy while having monopolistic powers over the regions they managed (Akanonu, 2020). This has turned out to be trust misplaced as this structure is quickly degrading back to the previous status quo of ineptness and a lack of transparency with the current tariff system classifying customers into different brackets with each bracket having different costs per kilowatt-hour of energy; this has insidiously become a path towards introducing a form of elitism in distribution, and a barrier to egalitarian service. However, the introduction of the prepaid electricity billing system has ensured DISCOs nationwide fulfil their responsibility of supplying power as without good and reliable service they run the risk of running their businesses at a loss (Sipasi, 2018). Hence, there has been a slight improvement in power accessibility. Yet, many challenges remain with gas shortages to power plants due to periodic vandalism, instability in gas prices effecting somewhat sinusoidal billing and seasonal power drawbacks, the failing of dams hence general reduction in generated power, etc (Nwanya et. al, 2018).

Exploring Solutions to Nigeria's Energy Poverty

In light of developing solutions, one must keep in mind the sustainability of those solutions with the world going green and the global goal of net zero emissions by the year 2050 (UN, 2020). Nigeria currently ranks 17th globally as regards Greenhouse Gas (GHG) emissions, only falling behind by one spot to South Africa who takes the top spot in Africa (Dunne, 2020). As regards reducing emissions, Nigeria in 2017 ratified the Paris Agreement promising to take measures towards generally reducing "business-as-usual" GHG emissions by 20%, and towards ending gas flaring by the year 2030 (Dunne, 2020). However, Nigeria's approach beyond the agreement has been far from optimal especially based on energy policy. In April 2019, Senator Ben Murray Bruce put before the Nigerian Upper Chamber, The Senate, the Electric Car bill which aimed at phasing out petrol and diesel-powered vehicles for cheaper and environmentally-friendly electrically-powered vehicles by the year 2035 (Ojoye, 2019).

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This is in line with the global net-zero emissions target. The bill was however shot down by the senate without even passing the first reading (Famuyiwa, 2019). Conversely, in 2020, the Minister of Mines and Steel Development, Mr Abubakar Bawa, declared plans by the Federal Government to boost power generation through coal stating that coal-to-power generation could boost generation capacities to about 53, 900MW by 2030 (Alasa, 2020). Nigeria currently flares almost 8 billion cubic meters of natural gas annually, posing a severe health hazard to communities where these plants are situated while also contributing immensely to the global GHG emissions (World Bank, 2017). Clearly, Nigeria's approach towards tackling energy concerns is out of touch with current realities of climate change, and even more, the affordability of renewable energy options.

Onto exploring solutions to this energy crisis, with the imminent nature of climate change and its adverse effects the direct solutions can be found in renewable energy options. The general notion with Nigeria and energy is laced with a bias of the usage of fossil fuel generated energy due to the nation's history with crude exportation and gas flaring, however, renewable energy is not exactly foreign to Nigeria. Historically, renewable energy resources in the form of hydroelectric power were the oasis in Nigeria's search for energy options with the development of dams and hydroelectric power generation plants with the famous Kainji dam being fully constructed in 1968 with an installed power generation capacity of about 800MW (Institute of Civil Engineers). Since then, many more such plants of various capacities have been constructed to support this output. However, of all renewable energy sources, hydroelectric power generation may just be the most capital intensive. Nigeria is blessed abundantly with large rivers and waterfalls. In fact, potential power returns from the Niger and Benue rivers as well as Lake Chad basin sit at approximately 14, 120MW with current installations capable of operational generation of about 2, 500MW (Hydropower, 2018). Hence, there remains about 85% of power untapped which would potentially boost current generation capacity. However, the cost of exploitation required for Hydroelectric Power (HEP) is immense (Ingram, 2020), and would require concession or part-ownership deals with the Chinese based construction companies, or major loans which would take the government years, maybe even decades to repay. Large scale HEP plants might be difficult to fund, however, focusing on developing small scale HEP plants in rural regions would be a cheaper and easier route towards reaching a full, national electrification grid. Nigeria can generate over 3500MW potentially from small hydroelectric power sources with only 64.5MW of this energy pool currently being exploited (GET. invest, 2020). Compared to industrial areas, rural areas have immensely low power requirements hence plants created based on local rivers specifically for the power demands of these areas would go a long way towards solving rural electrification, thus, reducing current loads on major plants. Building kilowatt-based HEP plants with growth potential would be a

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cost-effective approach as this would first meet the needs of these rural areas, and furthermore, would have the potential to grow as these communities develop (Ohiare, 2015).

We cannot discuss renewable energy resourcing without considering the potential of Solar Power Generation, especially in a country like Nigeria. With an almost full yearly sunny weather pattern, the potential for Solar Power is enormous. According to GET. Invest, a programme that aims at mobilizing investments in decentralised renewable energy projects, "the designation of only 5% of suitable land in central and northern Nigeria for solar thermal would provide a theoretical generation capacity of 42,700 MW" (GET.invest, 2020). This is more than triple the potential of HEP generation. Another approach from solar would be to encourage citizens to privately adopt solar power options by affording private businesses leeway to enter the market creating competition to ensure price stability and affordability, while also incentivizing citizens by attaching tax cuts and other such benefits to personal solar power adoption. The potential energy returns from a combination of the above exercises cannot even be properly estimated as it can begin a solar revolution like in the case of Germany who currently have installations capable of generating a whopping 49GW (Werhmann, 2020). As regards affordability and capacity, solar power generation is one of the most progressive renewable energy sciences with an average annual growth of about 37% in the science. Summarily, it has become and is bound to become increasingly economically viable with the passing years.

Other sources of renewable energy that can contribute to addressing Nigeria's energy poverty are biomass and wind power generation. These have more modest potential with energy generation, however, sufficient investment in research and project financing can also see them meet at least about 5% of Nigeria's energy demands.

CONCLUSION

Summarily, going green entirely as regards power generation is not only possible but has become more likely with recent advancements in renewable energy making it more affordable for both developed and developing countries like Nigeria. Currently, Costa Rica, Albania, Paraguay, Norway, even, Zambia and Ethiopia; all these countries either generate electric power with renewable sources up to 100%, or something close to those figures. Generally, these countries utilizing combinations of wind, solar, hydro, biodiesel, etc, have been able to move entirely away from unclean energy sources while also meeting their energy demands at reasonable costs. Another general approach towards pursuing these goals would be to encourage private investors to pursue energy research and installation. Over the last six decades, the Nigerian Government has been solely responsible for power generation, and still have not been able to maximize the potential of already explored resources. Privatization of government-

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owned resources has proven to be efficient in generally improving efficiency and productivity in various sectors with telecommunication in Nigeria being a prime example. Also, public-private partnerships would also be another utilitarian approach toward meeting Nigeria's energy demands. This has been used previously for projects like the Lekki-Ikoyi Link Bridge with the Lekki Concession Company and other such projects. Nigeria clearly has a way out of its energy poverty with other African countries like Zambia and Ethiopia being ready models for study and application. The central question now is if its government is prepared to take the appropriate steps.

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